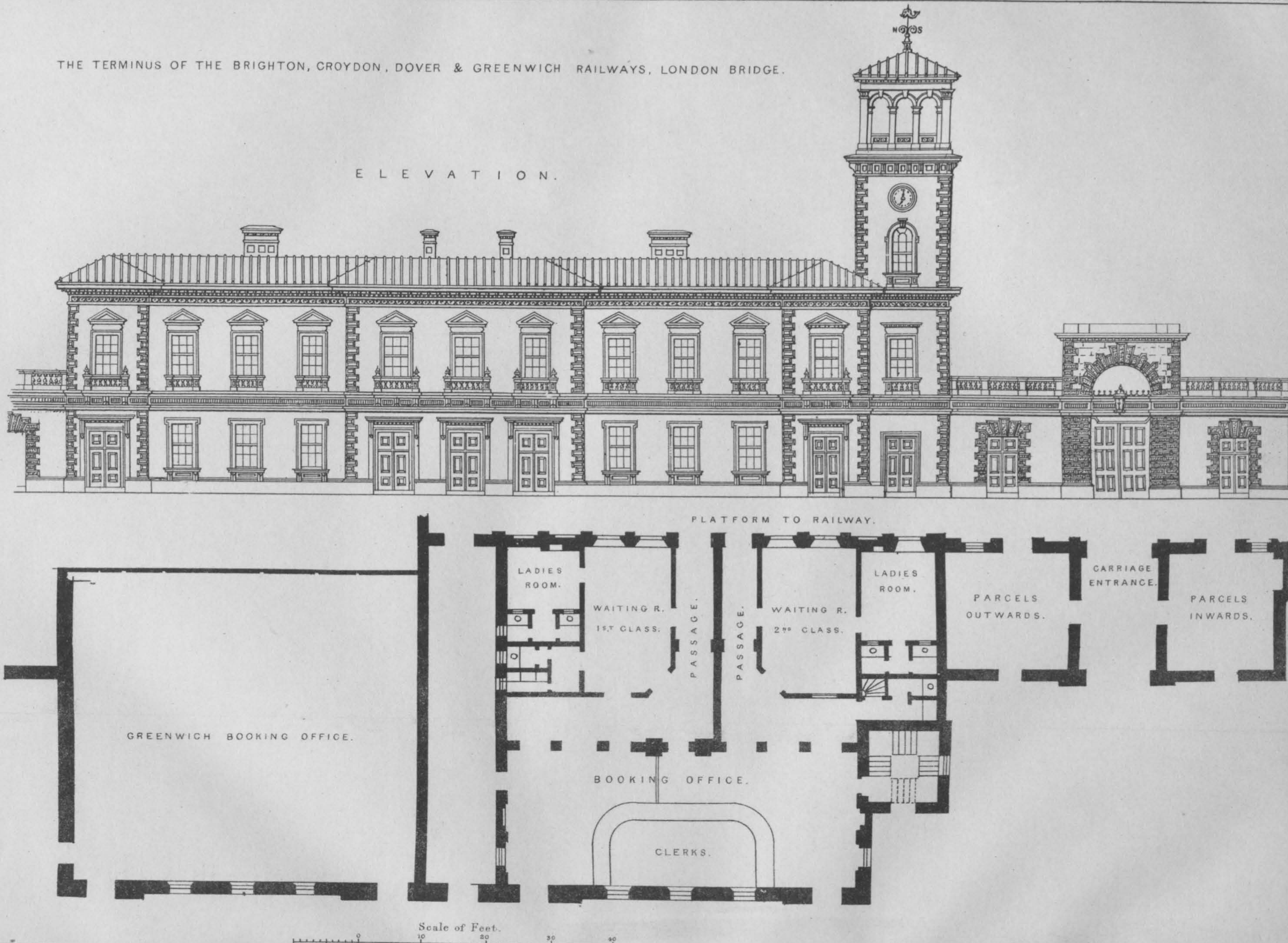


J. R. Jobbins 3 Warwick Ct.

THE NEW TERMINUS OF THE BRIGHTON, CROYDON, DOVER, AND GREENWICH RAILWAYS AT LONDON BRIDGE.

(With an Engraving, Plate XV.)

We have at length the pleasure of presenting to our readers some particulars of the New Joint Railway Terminus at London Bridge, the extensive works of which have been in progress during the last 18 months, and are now all but completed, so far as respects the portion to be executed by the Brighton, Croydon, and Dover Companies; and our remarks are accompanied by a view of the entire façade, as it will appear when the Greenwich Company's portion of the building shall have been completed, together with a ground plan.

From the time of the passing of the Acts of Parliament for the construction of the Brighton and Dover lines of railway, it became evident to the Directors and Engineers of those undertakings, that the Croydon terminus at London Bridge would be found not only totally inadequate to the carrying on of the united traffic of these lines of railway, but that its position to the north of the Greenwich station was inadmissible, involving as it did the inconvenience and danger of crossing the Greenwich line of railway at the departure and arrival of every train; and in due time arrangements were accordingly entered into with the Greenwich Company, by which the original Croydon station was made over to them in exchange for the original Greenwich station, together with an extent of new works on the south side thereof of equal area; by this arrangement, combined with the widening out of the Greenwich viaduct from the Croydon junction to the terminus, from which point four lines of rails are now provided, the Greenwich traffic is kept entirely distinct, and to the northward of that of the Brighton, Croydon, and Dover lines: while by a happy agreement between the four different companies, assented to on the part of the Greenwich company, by the advice of their talented architect George Smith, Esq., a complete unity of design has been preserved in the entire façade, as seen from the approach from Duke Street.

The whole extent of surface now occupied by the joint station, is 130,000 square feet, or about three acres. And when it is considered that the whole of this extensive surface has of necessity been raised by massive piers and arches to an average height of about 23 feet above the natural surface of the ground, some idea may be formed of the magnitude and cost of these works, in which, exclusive of the old Croydon and Greenwich terminus, above 8,000,000 of bricks have been consumed.

On entering the station the spacious and elegant iron roofs attract notice; the surface covered in by this means includes an area of 48,000 square feet, or upwards of an acre, affording ample scope for housing and cleaning the numerous carriages of the different companies, and securing from the weather the spacious arrival and departure platforms, and the space to the south appropriated to carriages waiting the arrival of trains.

These roofs are supported by three rows of cast iron fluted columns, of elegant design, connected together above their capitals by ornamented arched ribs, which carry the trusses of the roof; the rain-water is received into cast iron gutters communicating with the columns, which being cast hollow, convey away the water to the pipes and drains of the substructure. In the construction of these roofs, Mr. Rastrick has observed the same peculiarity of form in the struts as he employed at the roofs of the terminus at Brighton, but in this case, instead of being of wrought iron tubing, they are of cast iron, hollow, and fluted to harmonise with the fluting of the columns, and the nuts at the end of the king and queen rods are concealed by ornamental foliated pendants. The whole area is well lighted by sky-lights on either side of the ridge, running nearly the whole length of the roofs, and numerous others in appropriate situations.

The arrival and departure platforms, each 21 feet in width, are fine specimens of Bangor slate paving, in slabs, averaging 6 feet 6 inches by 4 feet each. On the arrival platform is a travelling luggage enclosure, deserving of notice, as being well adapted to its purpose, and less unsightly than such contrivances usually are.

To avoid confusion, a back entrance to the station has been provided by means of an inclined plane, commencing at the south end of Joiner's Street, by which cabs and omnibusses are allowed to enter and wait the arrival of trains, by which means the inconvenience of the confined space in front of the principal entrance is very much lessened.

The goods warehouse stands on the east side of Dean Street, communicating by a bridge with the spare carriage house on the west. The cranes for hoisting and lowering are worked on the pneumatic principle, by a small steam engine placed under the tank, which supplies the station with water.

On referring to our engraving, it will be seen that the advanced portion of the façade consists of a centre, in which are three doorways, and two wings with a doorway in each; that in the right wing is the first class passengers' entrance to the booking offices; the right hand door of the centre is the second class entrance, and the centre doorway is the way for luggage; and the remaining doorways are the first and second class entrances to the Greenwich company's offices. Receding from the principal front on the right is the campanile rising to a height of 97 feet from the level of Tooley Street to the summit of the vane, and exhibiting an illuminated clock for regulating the times of the arrival and departure of trains.

Still further removed from the line of the principal front are the offices for the arrival and departure of parcels, (forming the extreme wings of the façade,) united by a lofty archway, which serves as an entrance for gentlemen's carriages departing by the trains. The interior of the building contains on the ground-floor the general booking office 53 feet by 21 feet, with separate entrances, passages, and waiting rooms, for first and second class passengers, so arranged, that the two classes are kept distinct, until they arrive at the platform, to effect which objects, the arrangements seem well adapted. On the one-pair floor, to which we ascend by a stone staircase in the tower, there is a large room for the public meetings of the companies, and three others for the use of the joint station committee, secretary, &c., besides the apartments of the housekeeper; a secondary staircase from this part of the building leads to the clock room, in the upper floor of the tower, and above this to the lead flat, at the level of the principal cornice, from which, between the arches of the upper part, an extensive view of the metropolis and its southern suburbs is obtained.

To carry out their object, the committee availed themselves of the professional services of J. N. Rastrick, Esq., and W. Cubitt, Esq., as their joint engineers, to the judicious counsel of whom they are mainly indebted for the amount of accommodation secured in so confined and difficult a situation.

In the architectural department, Mr. Henry Roberts has been generally consulted, the designs being prepared, and the works more immediately superintended by Mr. Thomas Turner, the resident architect and engineer; and we deem it due to the taste and talent of the latter gentleman to state that we are indebted to him for the elegant Italian composition represented in our engraving.

We remember, that in the competition for the new Infant Orphan Asylum, the second premium was awarded to Mr. Turner, and we think his present effort entitles him to be considered as one of the rising architects of the day.

OBSERVATIONS ON ARCHITECTS AND ARCHITECTURE.

By Henry Fulton, M.D.

No. 3.

The Institute of British Architects is making a collection of all the editions of the works of Vitruvius. As soon as this collection shall be formed, which ought to contain as many copies of each edition as possible, the entire, together with all the works of Palladio and Sir William Chambers that can be procured, should be piled together and burned, and the ashes collected after the manner of the ancients and deposited in a suitable urn, and let the spirits of these mighty authors rest in peace. The Institute is in the habit of giving medals and prizes for essays; it would be well to give a medal for the best essay on the propriety of such a sacrifice at the shrine of architectural taste. Although the destruction of these works would not destroy the existing memorials of them, nor yet perhaps work out much improvement in the taste of those architects who are grown old in the love of them, yet the advantage to the rising generation would be great, and a new order of things would arise.

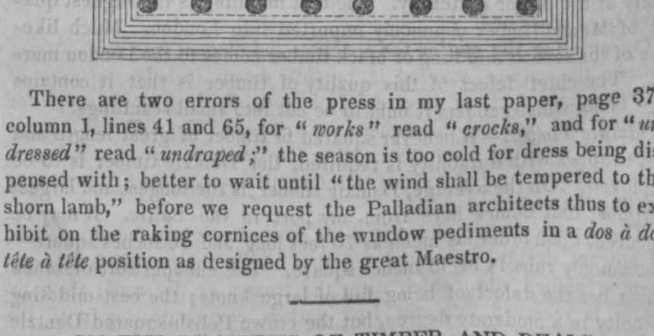
There is a ROYAL ROAD to a correct taste in Grecian architecture and every other style, (except, perhaps, the Gothic,) it is the straight and consequently the shortest road to excellence; it is comprised in this AIM AT CHASTENESS, UNITY, AND SIMPLICITY; ornament as highly as you please, finish as elaborately as you can, but still recollect that all must harmonise with chasteness of composition, unity of design, and simplicity of character: such are the features to be recognized in the rude remains of Possidonia, and such is the character of the highly finished, though ruined and despoiled edifices at Athens. This road will lead us to study the best proportion; will lead us to be more anxious with regard to the quality than to the quantity of ornament. There are few things which distinguish a civilized from an uncivilized people more than the love of displaying extravagant ornaments on their persons, particularly the softer sex; our own lovely countrywomen set off their beauty and show their sense by a few but well selected ornaments; others, not so highly gifted in person, but making up for that deficiency by good sense and taste, use no ornament which can make them remarkable; and others again, deficient both in mind and person, show the first in attracting observation to the latter, by a display of too much ornament. Does, or rather did, the gilding of the nondescript cages, which surmount the National Gallery, redeem the want of chasteness, unity, and simplicity? By the way, these cages ought to be removed to the Zoological Gardens.

In pursuing our journey by the royal road, we shall not be tempted to seek for variety for the purpose of "relieving the eye." Vitruvius gives us his theory of the proportions of columns as to that of the human figure, this is sheer nonsense; but it is not nonsense to observe that in the human form there are no breaks, no angles except those necessary for some purpose in the economy of our being. How well the Greeks understood the appropriate manner of relieving the eye, may be seen from an inspection of the Elgin marbles; the figures of the pediment, intended to be raised far above the point of vision, are in high relief, those of the metopes, which were nearer, are in a lower relief, and those of the frieze of the pronaos still lower, because intended to be seen directly from beneath; had they projected, the effect would have been anything but pleasing. The architects of the interior of St. Peter's understood the effect of due proportion well—the figures with which it is ornamented are increased in size in proportion to their elevation, and hence in optics the most perfect unity of proportion is obtained. To a want of the consideration of this may be imputed the poverty of our crowning cornices, and the necessity which is improperly created for the use of those hideous balustrades on the tops of our edifices: man dislikes monkeys, they imitate humanity so abominably—and the quadrumana themselves, as they rise above each other in the scale of intelligence, shun the society of those below them: the horse abhors the ass, because it is a caricature of himself: and if columns were animated they would reject all association with balusters; but although they cannot speak, the effect produced shows us the incongruity.

An architect should be in his line what Raphael was in painting, not the pupil of Perugino, nor the disciple of Palladio, but the scholar, whose mind should be enlighted by a ray emanating from the works of Da Vinci or the ruins of a Greek temple. And here we may observe, that as Raphael did not think it necessary to copy the works of Da Vinci, in order to arrive at the excellence which he attained, neither is it requisite to copy the works of the ancients, provided the same principles guide the modern architects which enabled the ancients to produce theirs.

Greek and Latin are called dead languages, and any author writing in them must, to write well, compose in the style of those authors who are considered to be classical; the ideas of the modern writer may be new, but the style and construction are old; so it is with the Greek, Roman, and Gothic styles of architecture. We may, indeed, invent a new order or style out of these, just as French, Italian, and Spanish were formed on the root of Latin, after it was barbarised by the Goths and Vandals; but the new style so invented will require to be refined and polished, as those languages were in the hands of men of master minds. Without, therefore, asserting that the door for change and improvement should be considered as closed to us, it is folly to require architects to give a composition in any particular style, and at the same time say that they are not to be bound down by the rules which governed those who invented the examples from which we learn it. The lovers of pure architecture have some consolation when they see many of the edifices which are every day served up to them, for they may hope that even out of absurdity itself (and we have enough of it), good may eventually arise in the shape of a new style, as I have, in former papers, endeavoured to show that the Gothic did out of the debased Diocletian.

In the last number of this *Journal*, page 376, a ground plan of the proposed façade for the British Museum is given; I freely confess that it promises better than anything which I feared was to be given to us; and I have no doubt the drawing of the elevation will appear strikingly magnificent; but, let Sir Robert Smirke remember and let the public understand, that the building itself must have a very different effect, for the porticos of the wings being seen first and nearer to the eye than that of the recessed centre and principal one, will appear colossal in proportion. In one of two ways, and with the same number of columns, this might be obviated. First, by making the centre a colonnade (without any pediment) with steps on the three sides, and adding another column to the depth of the front of the wings; or, secondly, by arranging the columns of the centre portico after the manner of the Roman Pantheon—thus:



There are two errors of the press in my last paper, page 374 column 1, lines 41 and 65, for "*works*" read "*crocks*," and for "*undressed*" read "*undraped*;" the season is too cold for dress being dispensed with; better to wait until "the wind shall be tempered to the shorn lamb," before we request the Palladian architects thus to exhibit on the raking cornices of the window pediments in a *dos à dos tête à tête* position as designed by the great Maestro.

ON THE QUALITIES OF TIMBER AND DEALS.

On the several species of Fir Timber and Deals supplied to the English Market, and their respective qualities for the purposes of Building. Read at the Royal Institute of British Architects, Nov. 20, 1843. By GEORGE BAILEY, ESQ., Hon. Sec.

In the practical part of the profession of an architect, and especially in those branches which occupy by far the greater portion of the time and labour of most of us, the security of our foundations is certainly the most important object to which we have to direct our attention,—the second in importance is undoubtedly the choice of our timber.

The properties of the various descriptions of wood coming under the denomination of timber—their relative strength and durability—their fitness for the various purposes of building, with regard to their stiffness in different situations and under different conditions, have all been treated scientifically and practically, in a manner highly useful to the architect, and the results have long been in our hands.

The attention of the profession has even been called, both in ancient and modern works, to the planting, growth, and felling of timber, and the varieties which local circumstances and soil may produce in the same species. That information of this kind is in the highest degree useful to the architect, and indeed indispensable to be known, is not to be doubted, and the important practical results which may be derived from inquiries strictly scientific, must be familiar to all of us, who, on a former occasion, have had the pleasure of listening to the Botanical discources of our friend Dr. Dickson. But in the ordinary routine of our profession it is seldom, comparatively speaking, that we have to refer even to the original principles from which our practice is derived, and still less to questions connected with the organization and natural history of timber trees.

The architect, in fact, has seldom any connexion with the choice or conversion of his timber beyond certain limits. His choice is restricted to such qualities of timber, of such length and scantlings as he can find in the *market*, and on this point less information has been placed in the hands of the architect than any other connected with this subject. It has been thought, therefore, that a few words on the qualities of timber, to be found in the market as imported from the Baltic and from America, might not be unacceptable to the meeting. We will begin with European timber in the log, then proceed to American timber, and afterwards to the subject of deals.

Baltic Timber.

Memel Timber.—The largest supply of square fir timber brought from any part of the Baltic to this country at the present time is from Memel: it is divided into three qualities—the best, termed crown, the best middling, and second, or brack Memel.

Of the first quality little comes to the London market, but a considerable quantity to the outports. It is of admirable quality and manufacture, nearly as clear of knots as the Riga timber, but not quite so close in the grain, nor so rigid, nor so durable: the more free it is from knots, the more liable it is to be shaky at the core. The knotty timber is less liable to this defect at the heart, because the knots serve as bolts through the timber to keep all the parts together. Crown Memel timber is usually somewhat more than 13 inches square, and the best of it is from 28 to 55 feet long, that which is longer being usually knotty at the upper extremity. The best middling is the highest quality of Memel timber commonly imported into London. Much likewise of the second middling or brack timber comes to the London market. The chief defect of this quality of timber is that it contains large knots which renders it unfit to be cut into small scantlings.

Dantzic Timber.—Whenever squared fir timber of great length and size, coupled with durability is required, the Dantzic timber is to be employed. On the average, Dantzic timber is the longest and largest fir timber that comes here from any port in the Baltic. It may be procured, upon order, as much as 70 feet long and 16 inches square—it commonly runs 14 or 15 inches square. The cheaper sort of brack timber has the defect of being full of large knots; the best middling is knotty in a moderate degree, but the crown Polish-squared Dantzic timber, that which has been squared in the province where it was felled, may be considered, upon the whole, the very best timber that the north of Europe supplies,—next to that of Riga, it is the most durable of fir timber.

The timber from Pillau, Konigsberg, and Stettin resembles that of Dantzic, but is rather coarser in the grain and more knotty: that of Stettin, though not very long, is sometimes of very large size, as much as 20 inches square.

Riga Timber.—Riga used formerly to be the port from whence almost all the fir timber in the log, from 12 to 13 inches square required n this country for building purposes was imported. As timber in the log, it is peculiarly applicable for beams, girders, and joists, being very rigid, and bending little under great weights; it is, moreover, very regularly squared, very straight, clear of knots, straight in the grain, and very durable. Owing to its rigidity and freedom from knots, it is, however, more liable than some other timber to the defect of being rent and shaken at the heart, for which reason the fir timber from other ports on the eastern coast of the Baltic is by many preferred for building purposes and less of this species of timber is consequently now imported into this country.

Formerly a considerable quantity of timber in the log was imported from Narva, St Petersburg, and Archangel, but scarcely any now comes from these ports—the St Petersburg timber is defective as being very subject to rend itself and become shaky as it dries.

Norway Timber.—But little timber and that of small scantling is now supplied from Norway, although at one time, large quantities were imported from Longsound, Porsground, and Brewick, but owing to the change in the mode of taking the duty some years since, by which the small timber of Norway was made liable to the same duty as the large timber from the Baltic (an exception being made only in favour of timber used in the Cornish mines), the importation of timber from that country almost ceased:—it is now, however again making its appearance in the London market. Some of the superior Longsound timber is of an excellent quality, and is, perhaps, the most durable of fir timber.

The timber from Gottenburgh, Stockholm and Geffle is not usually well squared, seldom exceeds 30 feet in length, indeed is generally much shorter, and has, moreover, the bad property of rending and becoming shaky if kept in the state of the log, so that unless immediately converted, it loses much of its value; very little, however, of this timber is now imported into England.

American Timber.

The only description of American timber known in this market in the state of the log, are the *red pine* and the *yellow pine*—for although pitch pine has been brought here, *viá* Halifax, from the southern ports of the United States, yet that species of fir timber is scarcely known in this country as an article of consumption; it is said to be extremely brittle.

Red Pine.—The red pine approaches very nearly in quality to Riga timber; it is almost as stiff and is free from knots, but the irregular manufacture and tapering of the logs occasion much loss in the conversion of the timber for use in buildings; the manufacture of this timber is, however, improving, and it is consequently rising in public estimation. It is the produce of Upper Canada and the adjacent portions of the United States; it is brought down in rafts from the great lakes (on the borders of which it grows), by means of the River St. Lawrence to Quebec, where it is shipped for England. Great caution is necessary in the use of this timber; if the voyage from Quebec was as short as that from Riga it would not, perhaps, be more liable than Riga timber to take the dry rot, but owing to the length of time that it remains in the ship, or owing to the yellow pine wood, which, as deals or timber is generally in the same hold with it, a cargo of red pine timber seldom arrives which does not exhibit, on some part or other of the surface of the logs, indications of the presence of dry rot, and therefore, although the timber, if not so treated, might not be liable to this defect, yet treated as it has been before it arrives here, it often is infected, and if then placed under circumstances only slightly favourable to the growth of the fungus, it will be the means of introducing the dry rot into a building, unless a closer examination be made of the surface of each log to be used than is usually done, or some means adopted to counteract the infection.

Yellow Pine Timber.—The yellow pine timber in the log comes from Quebec, from St. John's, from Miramichi, and from some other ports in New Brunswick. That from Quebec is not so fit for the better purposes to which yellow pine is applied as that of St. John's, nor is that of St. John's so fit for those purposes as that from Miramichi. That of Miramichi is the lightest and most spongy, and the least fibrous of all. It is exceedingly mellow, to use the joiner's term, has no tendency to warp, and preserves the form that the workman gives it. Yellow pine timber ought not to be used for rafters, joists, girders, or plates, in any building; for no purpose, in short, and in no situation, where strength and stiffness are required, and where the ends or any part of the timber come in contact with brick-work or masonry, or are liable or subjected to damp. Yellow pine timber is not rigid; it is deficient in strength; will break with a less weight than almost any other kind of timber; and, except in perfectly dry situations, or where it is thoroughly well ventilated, is extremely liable to take the dry rot.

Deals, Planks, and Battens.

The first thing to be considered, as regards deals, is the quality of the wood. Many deals are of durable quality, and fit, on that account, for rough out-of-door purposes, and coarse floors or carpentry, but they are wholly inapplicable for fine joiner's work; for when the saw has passed through and reduced them to small dimensions, they warp and twist like a piece of whalebone. Deals of this character are termed by carpenters "*strong*." Such deals have likewise the bad property in general, of rending themselves to pieces as they dry, and become shaky. Deals that, when acted upon by the saw, do not form sawdust, but are torn into long strings or fibres, and, on that account, termed "*stringy*," are in general of this strong nature. Such deals are likewise less uniform in their texture, and vary more in the alternate fibres and cellular parts than the deals which are fit for the joiner. The deal to be good should have a certain degree of softness, easily yeilding to the knife or chisel. Such deals are to be distinguished by their light weight, in comparison with the strong fibrous deals, and when planed, they exhibit a silky texture. Some deals, and particularly the stringy deals, are very hygrometric, and never lose the property (however long they have been seasoned), of expanding and contracting with change of weather. White Petersburgh deals are said to have that property. The deal to be good should be straight in the grain; if cross grained, it generally becomes shaky diagonally upon drying, and falls to pieces under the saw; or, if cross-grained in a lesser degree, it does not yield a smooth surface to to the *plane*, but remains rough and fuzzy. The deal should, of course, be without coarse knots, and the more nearly it is perfectly clean the better. As to the manufacture of the deal; it should be square-cut; above all things, it ought not to have the centre or pitch of the tree left within it, since, where that is the case, the deal rends on drying. In yellow deals the sap, or albumem of the tree, ought to show itself only at the very edge of that part of the deal which was furthest from the centre of the tree. Deals are usually cut of three different widths, each of which has its appropriate name:—those from 11 or 12 inches wide are called *planks*,—those from 8½ to 10 inches are called *deals*,—and those from 6½ to 7 inches are called *battens*.

Yellow Deals.

Norway Deals.—The yellow deals of Christiania, in Norway, have always been considered to be of the very best description;—they are so in two senses—they are both durable and mellow; mellow meaning, soft, light, and fit for the joiner. Though soft, they are not wanting in a proper degree of stiffness. When properly seasoned, previously to being used, they remain (however minutely divided) precisely of the form that the joiner gives. This quality applies to the white, as well as to the yellow deals of Christiania—and to those above the deals of any other part of the world—and, therefore, the deals of Christiania will always be the material that the consumer will endeavour to obtain, if the price will allow him to do so.

Of late years the mode of taking the duty caused the deals to be cut in longer lengths than the timber would afford, so that inferior wood has been brought into the London market, and the high estimation and price diminished to a certain extent; it is said, however, that they are now rapidly regaining their former character.

The Yellow deals from Frederickstadt, in Norway, are very nearly the same in quality with those of Christiania, and generally obtain nearly the same price in the market. The white deals would be as good as those of Christiania, but for one defect, which is that the bark of the tree adheres to the knots, which, therefore, have a black ring round them; when the deal comes to be cut into board, a knot of this kind is apt to fall out. It may be observed that neither the deals of Christiania nor Frederickstadt are of as good quality as they used to be, particularly as respects the yellow deals.

There are several kinds of yellow deals not quite so good as those of Christiania in the quality of the wood, and yet coming near to them, which formerly used to be imported from Norway in very large quantities, and still are imported from some of the places of shipment referred to, but to a moderate extent only. The principal of these ports are Longsound, Porsground, Larwig, Krageroe and Dram. The cloister deals from Longsound 2 inches thick, and the broad and clean deals from Krageroe 1½ inch thick and 14 feet long, were noted for their excellence. From Dram, an immense quantity, both white and yellow, were imported, usually 10 feet long and 2 inches thick. The "lowland" deals from this port are of inferior quality, but the "upland" of superior quality.

Of the deals of most of the above-mentioned ports it may be said that they are good as regards the texture of the wood, but small in size, as they are seldom more than from 8¼ to 8¾ inches wide. Some few deals (principally white deals) used to come from Tonsberg, occasionally there was a considerable supply from Frederickstadt and Moss; the yellow deals of those ports are of bad quality, and the white deals not much better. Of the white lowland deals of Norway, in general it may be said that they resemble in quality the white spruce deals of America; they have the same tendency to warp and to rend on drying.

Deals of Sweden.—The yellow deals of Sweden nearest in quality to the best yellow deals of Norway, as regards their being at the same time durable and mellow, are those which come from Stockholm and from Geffle in the gulf of Bothnia. If Stockholm or Geffle deals were quite as mellow as Christiania deals, they would be preferred to those of Christiania, on account of their full size and freedom from sap, but they are somewhat more disposed to warp, and with regard to Geffle deals to have coarse knots. There are some other ports in the gulph of Bothnia, viz., Hernosand and Sundswall, from which cargoes of yellow deals are shipped, occasionally little inferior in quality to those from Stockholm and Geffle. But it may be said of most of the deals from those ports, that in them there is in general an exaggeration of the faults perceptible in the deals of Stockholm and Geffle. A large portion of the deals from Hernosand and Sundswall are from 18 to 21 feet long and 10 inches wide. The deals of Soderham and Schonwick are of a still harder and coarser nature than those last described. The yellow deals of Gottenberg although very free from sap, and durable, yet have the fault of being rigid and unfit for the joiner; they are, however, well adapted for rough purposes, both in and out of doors, on account of their durability.

Deals of Northern Russia.—The yellow deals of Archangel and Onega are very similar to each other in quality, and of all deals, they approach in one respect the nearest to the yellow deals of Christiania; they are exceedingly mellow, and fit for the joiner—on the other hand they are not very durable or capable of resisting damp, for which reason they ought not to be used in the ground-floor of a house; the knots are apt to be surrounded by dead bark: they are imported of the average length of 20 feet. Archangel deals formerly were imported only of the width of 11 inches, or 7 inches, that is, in the state of plank or of batten, but more recently they have been imported of the width of 9 inches, and from the certainty of obtaining entire cargoes of the very first quality, without any admixture of inferior goods, (an object which could seldom be accomplished with regard either to Norwegian or Swedish deals,) these Archangel deals were made to supersede the use of almost every other superior description of European yellow deals. St. Petersburg and Narva yellow deals come of the breadth of 11, 9, and 7 inches: in quality the wood is inferior to that of Onega or of Archangel: Petersburg deal is less durable and not nearly so mellow as either the Archangel or Onega deal; it is said to be nearly as liable to take the dry rot in a damp and confined situation as the yellow pine deal of America. A few yellow deals are likewise imported from Riga.

The yellow deals from Memel and from Dantzic may next be noticed:—the former 11 inches, the latter 12 inches wide; both of these are very durable. Memel planks are well adapted for all rough purposes out of doors, for barn floors, and for the steps of stairs when clean; Dantzic planks are used by brewers and distillers for making the large vessels for holding the liquor, called backs. The very best of the Dantzic planks are likewise extremely fit for joiners work, as they are soft and mellow, and retain the shape, but this only applies to a small portion of them, and those which are soft, are not so durable. Dantzic likewise affords the long yellow plank 40 feet long, 3 inches thick, and 12 inches wide used for the decks of ships. Memel planks until of late years, were not imported in any large quantity.

There are likewise yellow deals from Finland; Nyland deals 14 feet long, resembling some of the coarser varieties of Sundswall deals, are of late introduction. The broad yellow planks 12 inches wide and 21 feet long from Biorneburg in the gulph of Bothnia, are of a quality very nearly approaching to the plank of Archangel, but far more knotty.

White Deals.

We now come to the *White Deals* manufactured from *Spruce Fir*, the yellow deals of Europe being manufactured from the *Scotch Fir*. All that has been said of the qualities of yellow deals applies likewise to white deals, except that the sap in white deals is not discernible from the heart, and therefore the manufacturer of white deals has so far one difficulty the less to contend with.

Norway is the only country from which white deals of the very first quality are imported in any quantity; for although the white deals from Stockholm and Geffle in Sweden, like the yellow from those parts, are very good, yet the quantity is too small to render them worth particular notice. The white deals, like the yellow, shipped at Christiania are the very best in the world; well fitted for joiner's work, being above all other deals of the kind, light and mellow. The white deals of Frederickstadt also are very good, yet rather subject to a small black knot surrounded by dead bark. All the other ports in Norway which have been mentioned as yielding yellow deals, supply white deals of good quality likewise; but from the smaller ports generally, the deals are somewhat narrow, (from 8½ to 8¾ inches wide,) whereas the deals of Christiania and Frederickstadt are full 9 in. wide; the narrow deals fetch a proportionately less price in the market. The white deals from Wekkeroe are sold by the name of Christiania deals, the least mellow and the hardest of which they resemble; they are of greater average length than the deals of Christiania, being perhaps of a mean length of 19 feet.

The Lowland white deals of Norway form the exception to the general good quality of the white deals of that country, the lowland white deals having most of the bad properties of the white spruce of America, that is a tendency to warp and to split upon drying. From Dram two qualities of white deals used to come, the upland and the lowland, the former as good in quality as the latter is bad, although it may be observed that both have of late years improved considerably. The white deals of Moss, though showy to appearance, are of this bad quality. Those from Longsound, Schien, and Larwig, are good. A considerable quantity of white deals have of late years been shipped from Gottenburgh—with few exceptions, they are of a hard stringy nature; the saw on passing through them tears their substance into strings instead of saw-dust: the white deals of the width of 11 and 12 inches from this port are, on account of their cheapness, one of the materials used by the makers of packing cases.

Russia.—Northern Russia exports hardly any white deals, although the few that come occasionally from Archangel, mixed by accident with yellow deals, are of excellent quality—the white deals from that country that come nearest to those of Norway in quality are those of Narva—they are brought of the width of 11 and 9 inches—when properly seasoned they can be used for all purposes to which Norway white deals are applied—next in quality to those of Narva are the white deals from Riga, which are brought both 9 and 11 inches wide. White deals are imported from St. Petersburgh, both 9 inches and 11 inches wide, in considerable quantities—they are not uniform in texture, but contain hard veins, and they have the defect, (however long they may have been kept,) of expanding and contracting with change of weather, so that if used in the panel of a door, the wood alternately enters and recedes from the groove into which it fits, as the paint will show, when that kind of deal has been used for a panel.

Battens are deals 7 inches wide, and are principally used for floors. The best yellow battens are imported from Christiania; a large number of both white and yellow battens were formerly imported from Longsound in Norway, but battens of this description are now imported from Dram; they are from about 6½ to 6¾ wide. The white especially are of an excellent quality, and so are such of the yellow as are not sappy; the sappy ones preponderate in number, and on account of their cheapness are frequently used as a substitute for timber, in building the smaller description of houses. The next in quality to the battens of Christiania and Frederickstadt, are those which are imported from Archangel and Onega, though few have of late come from the latter port. Yellow Archangel battens cost usually somewhat more per Petersburg standard than the 11 inch planks. Both Archangel and Onega battens have the defect of having black bark round the knots, the wood of which is dead, whereas the knots of Christiania wood are bright, and firmly united to the substance of the tree. Yellow battens are imported also from Petersburg considerably inferior in the quality of the wood to those of Archangel and Onega.

American Deals are of three descriptions, viz., the yellow pine, the red pine, and the white spruce. A fourth, the hemlock-spruce deal is sometimes brought, but it is too bad in quality, and the quantity too small to deserve further notice.

Yellow Pine Deals.—The best of the yellow pine deals are shipped from the St. Lawrence; some are floated down the river from the mills to the port of shipment, and when taken on board are saturated with water, and covered with river silt, others are put on board craft, and come bright from the saw to this country. Of the bright deals, the very best quality are those from the Rivière de Loup. In a very good parcel of yellow pine deals about two-fifths will be perfectly clear of knots.

Yellow pine is of a very light and spongy texture, and the more completely it is of that texture and the opposite to what is hard, fibrous, and stringy, the better it is for all the purposes to which it is properly applicable, such as the panels and mouldings of doors and shutters, and other internal fittings of houses, the framing of cabinet-work; all those purposes in short for which lightness and no great strength is required. It preserves the form which the joiner gives it without warping, and this property, coupled with the facility of obtaining it free from knots, fits it admirably for the carver, the musical instrument maker, the maker of Venetian blinds, for patterns for iron castings and similar purposes; the inferior yellow pine deals being coarser in the texture of the wood and more knotty, are mostly used for ordinary packing cases. If the yellow pine is exposed to damp in any confined situation it rapidly decays, but in the open air, for palings raised from off the ground, weather-boarding to sheds, and wherever it is completely well ventilated, it lasts a long time, although exposed to alternations of wet and dry. Its spongy texture prevents it being rent so much as deals of a more rigid substance are liable to be, by exposure to the weather. It is now much used for the decks of ships, as it resists the effects of the sun better than the European deals.

Red Pine Deals come in very small quantities, so small indeed, that they are seldom separated from the yellow pine deals with which they come mixed; the best description are such as are brought from the Rivière de Loup. The red pine deals will answer for most of the purposes to which the yellow or Scotch fir deal of Europe is applied. When used for floors in houses, these deals have the defect of turning of a very dark colour, but this probably is owing to the resinous texture of the wood, which causes dust to adhere to its surface, and might be prevented by washing the floor with alkaline ley, or any other solvent of resin.

White Spruce Deals.—Of the American white spruce deals, none, not even the very best, are to be compared for quality to the white deals of the north of Europe. They have two faults—they are very liable to warp, and the knots in them (owing to the bark adhering to the branch while the wood grows over it), are liable to fall out and leave a hole in the board. However long they may be kept they never lose their property of warping, and are consequently unfit for joiner's work. They are used only for the floors of the most ordinary houses. They are extremely liable, if placed in damp situations, to decay. An instance of this is mentioned by Mr. Warburton, in his evidence upon the Select Committee on the Timber Duties, 1835, as having occurred in the floor of his counting house at Lambeth, which he had caused to be made of spruce deals as the cheapest material. An unusually high tide in the Thames overflowed it. It was covered at the time with oil-cloth, and the oil-cloth being replaced upon the floor before it was thoroughly dry; in less than a week the dry rot had spread over the whole floor, and had penetrated in some parts below the surface of the deals. Of this species, as well as of every other description of American deal, and most especially of yellow pine deals, it may be observed, that they ought only to be used in situations that are perfectly dry, or if not dry, that are completely exposed to the air. Spruce deals (particularly the spruce planks 11 and 12 inches wide) that come from St. John's and St. Andrew's in New Brunswick, are chiefly used for making packing cases.

It is stated that every deal of yellow pine that has been shipped in America in a wet state, when it arrives here, is covered over by a net-work of little white fibres, which is the dry rot in its incipient state. There is no cargo (even if it has been shipped in tolerably dry condition,) in which, upon its arrival here, some deals will not be found with the fungus begining to vegetate on their surface. If they are deals that have been floated down the rivers in America, and shipped in a wet state only, they arrive quite covered with this net-work of fungus, so that force is necessary to separate one deal from another, so strongly does the fungus occasion them to adhere; they will grow together again, as it were, after quitting the ship while lying in the barges before being landed. Accordingly if a cargo has arrived in a wet condition, or late in the year, or if the rain falls on the deals before they are landed, and they are piled flat, one on the other, after the usual manner of piling deals, in six months time or even less, the whole pile of deals will become deeply affected by the dry rot, so that wherever the flat surface of one deal lies upon the flat surface of another deal the rot penetrates to the depth perhaps of one-eigth of an inch. Its progress is arrested frequently by re-piling the deals during the dry weather of the month of March, and by sweeping the surface of each deal before it is re-piled with a hard broom; but, perhaps the best way is to pile the deals in the first instance upon their edges, by which means the air circulates round them, the growth of the fungus is checked, and the necessity of re-piling them prevented.

As respects the dry rot, it may be noticed, that there are but very few cargoes of timber in the log that come from America, in which, in one part or other of every log, a beginning of the vegetation of the dry rot is not apparent. Sometimes it will show itself only by a few reddish discoloured spots on the surface of the log, which, if scratched with the nail, it will be seen that to the extent of each spot the texture of the timber to some little depth is destroyed—it will be reduced to powder: a white fibre will generally be seen growing on these spots. If the timber has been shipped in dry condition, and the voyage has been a short one, there may be some logs without a spot; but if the cargo has been shipped in a wet condition and the voyage has been a long one, then a white fibre will be seen growing over every part of the surface of every log. It should further be noticed in connexion with this subject, that there are two descriptions of European timber likewise very liable to take the dry rot, yellow Petersburg deals and yellow and white battens from Dram in Norway. Battens that have been received from Dram and allowed to be a long time in bond in this country, without being re-piled in time, (as they ought to have been,) have been as much effected by the dry rot as many American deals, though this has not happened in as short a time as has been known to be sufficient to rot American deals. That the fungus growing on the surface of American timber is the dry rot appears to be quite certain: it has all its character, as to appearance and as to effect, for whenever it spreads over the surface, the deal, if neglected, is reduced to the state of powder.

These are a few leading facts connected with the important subject of the selection of such timber as is placed within our reach, and to which for the most part our choice is limited. For a mass of information on everything connected with the subject we may refer to the documents from which these few particulars have been chiefly gathered, the Evidence given before the Parliamentary Committees on the Timber Duties.

RAILWAYS IN INDIA.

In a preceding article we have spoken of the political and mercantile advantages derivable from the further extension of steam navigation in British India: we will now follow up the subject with a few further remarks on the still more important subject of *railroads*. India is confessedly an agricultural country; its internal sources of agricultural wealth, and its capabilities of production are literally boundless, sufficient to supply more than thrice its present population of 150 millions of inhabitants, with all the necessaries and luxuries of life; and, so far as regards its exports, to satisfy the wants of Great Britain, rendering her independent of foreigners for her supply of cotton, tobacco, sugar, and tea. Lords of the soil, the East India Company depend chiefly upon agriculture for their immense annual revenue, and consequently for the maintenance of their power: it is to this certain source the merchant looks for his wealth, the many millions for their support, and the manufacturers of this country for the means whereby they are enabled to maintain tens of thousands at home, and to supply every quarter of the globe with the fruits of their industry: nay, the very existence of the Honourable Company depends at the present moment, much more upon an immediate development of its internal resources, than upon continuing their career of conquest and acquisition of territory now so happily begun. It is not sufficient that they encourage private or public speculation, that they incur a large annual outlay in promoting agricultural objects, and use their endeavours to introduce better modes of culture and manufacture of the chief staple commodities: other, and more extensive measures must be immediately entered upon, in order to meet the wants and expectations of the age in which we live: the country must be thrown open to class colonization, to men of spirit and possessing some small capital, and its agriculture must be promoted by the means of railways in those central provinces which are deficient of navigable rivers.

Upon looking over the map of India it will be observed that many of the finest and most productive provinces are isolated, possessing neither good roads nor navigable streams; the rich products of Malwah, the southern parts of Allahabad, Gundwana, and Hyderabad, have to be conveyed to the respective markets on the backs of oxen; thus the cottons of these insulated provinces, after being collected and rudely cleansed, are transported to the banks of the Ganges in this manner, over, in some places, almost impassable roads, the journey being performed in not less than 20 or 30 days, during which time, the loosely packed bales are exposed to a burning tropical sun as well as to the dews of the night, and other mischances attending long and dangerous journeys: who then, after considering the rude manner in which this commodity is cultivated and cleansed, can wonder at its being inferior to the produce of the West? the only surprize is, that after this rude journey, and its equally rude modes of conveyance down the Ganges to Calcutta, it should be worth any thing at all.

The valley of the Ganges extending over a surface of 400,000 square miles, is so intersected with natural canals, as to render the adoption of railroads below Calcutta impossible, and many of the fertile valleys of India, from being annually inundated, will be found insuperable difficulties to their adoption in these particular parts: but, the vast plains of upper India, of the Deccan, and the Peninsular, present an inexhaustible field for the skill of the engineer, the architect, and the surveyor, in forming railroads. From Calcutta to Benares, now a distance of 444 miles, a considerable time might be saved by a railroad passing through the coal district of Burdwan, Magore, and the rich province of Bahar; or a still nobler road might be formed from thence through Berhampoor, Bhaugulpore, Dinapoor, Ghazapoor, Benares, Allahahad, Etawa, Kajghant Agra, Muttra, Delhia, to Kernaul, a distance of 1208 miles. Again, let railroads radiate from the tributary state of Nagpoor to Benares through Jubbulpore, Rewar and Mow Gunge, meeting the railway half way from Calcutta to Benares. From Nagpoor to Hyderabad, a distance of 315 miles over a very fair road, from Benares to Lucknow, Bariellу, Mouradabad and Hurdwar; a branch from Agra might be formed passing through twelve considerable places of trade to Gwalior, the capital of the Mahratta chief, a place of great note as a commercial and military depôt. From Nagpoor to Saugor via Taru Ghat to Chandar via Hingun Ghat. Nagpoor from its central position, its vast fertile plains adapted for the most extensive cultivation of cotton, &c., its proximity to other fertile provinces, and its position as a British military station, is invaluable as a central point of railway communication. From thence to Benares on the one side, and Hyderabad on the other, there are few natural impediments, none but what might be readily overcome by the skill of English engineers. Again, from Calcutta to Hyderabad via Masulipatam, the distance is only 225 miles by the present route, and there is little doubt, but that a railroad could be formed on this route, approaching to within a very easy distance from Calcutta: from Hyderabad to the Poovrah Ghats, the road is gently undulating, passing occasionally over narrow valleys rank in vegetation, which would require to be crossed by viaducts; the chief river is the Bemah, a deep rapid stream, but having a firm soil beneath the deep vegetable earth covering its banks, capable of supporting the viaduct or bridge. From the Madras to the Hyderabad via Cuddapap, Nundiaul, Pangtorr and Paungaull is a distance of 405 miles by the present route, the natural difficulties are far greater than other routes previously noticed, there being four great rivers to cross from the second barrier pass to Hyderabad. There is another route to Hyderabad via Nellove and Ongole.

Other routes from the central provinces to the presidencies, and from Calcutta to the Upper Provinces, might be pointed out as applicable to railway communication, but those we have already enumerated are sufficient to show the importance of railway communication in a country so densely populated, and so extensive. It may be said that the Indian government has no power to cause railroads to be constructed in the tributary states of Hyderabad and Nagpoor; but, in answer to this we must observe, that where they must derive such benefits, no reasonable objections can be made on their parts: that common roads have already been formed under the direction and control of the Bengal, Madras, and Bombay governments; and that the expences of constructing them are so insignificant as not to be worthy notice, in fact, are not to be compared to the cost of railroads in America. The land through which they pass costs nothing, labour may be had for 3s. or 4s. per month for each labourer; the Deccan, and in fact all India abounds with several kinds of acacia and other woods almost equalling iron in hardness and exceeding it in durability. The destructive attacks of the white ant on these wooden rails may be readily guarded against by the use of creosote, or mineral solutions, which will not only effectually remedy this evil, but preserve them from the effects of dry rot.

It is true that the skill of the engineer practically acquainted with the formation of railways in this country, is wanting for these projected improvements; but many able engineers may be obtained in this country, several also in the honourable company's service have greatly distinguished themselves in forming common roads, building bridges and other works of improvement, and schools for this department of engineering might be very advantageously established in the three presidencies, being placed under the control of practical engineers sent out from this country.

The only railway ever attempted in India, was that from Saugor to Calcutta, a distance of 50 miles through a swampy country periodically overflowed by the waters: it was an unfortunate project set on foot by a few individuals, inexperienced in knowledge of that portion of the country, and its failure, which was foreseen by every person of common sense, had the ill effect of discouraging future plans of the like nature based on better principles. We can hardly expect that iron rails can be adopted until such time as foundries are established in that country for manufacturing the native material, nor is iron at all necessary so long as India contains wood equally durable. For the protection and constant repair of these railways, it would be politic to have walled villages built every seven or ten miles: the tenure of occupation of land to a certain extent being held by the inhabitants to watching and keeping them in repair. Where the land is very soft and yielding, the rails should run upon piles driven deep within the earth and resting upon the firm strata beneath.

We trust that the East India directors will take this matter into their most serious consideration; the example, set by them would soon be followed by the union of private individuals, both native and European, as well as by the capitalists of this country, who at present find much difficulty in employing their capital to advantage. A slight glance at the amount of import and exports of India, at its internal trade, and boundless resources, must convince every one that railroads so cheaply constructed, and kept in order, must eventually prove exceedingly profitable.

THE NELSON MONUMENT.

(With an Engraving, a Double Plate, XVI.)

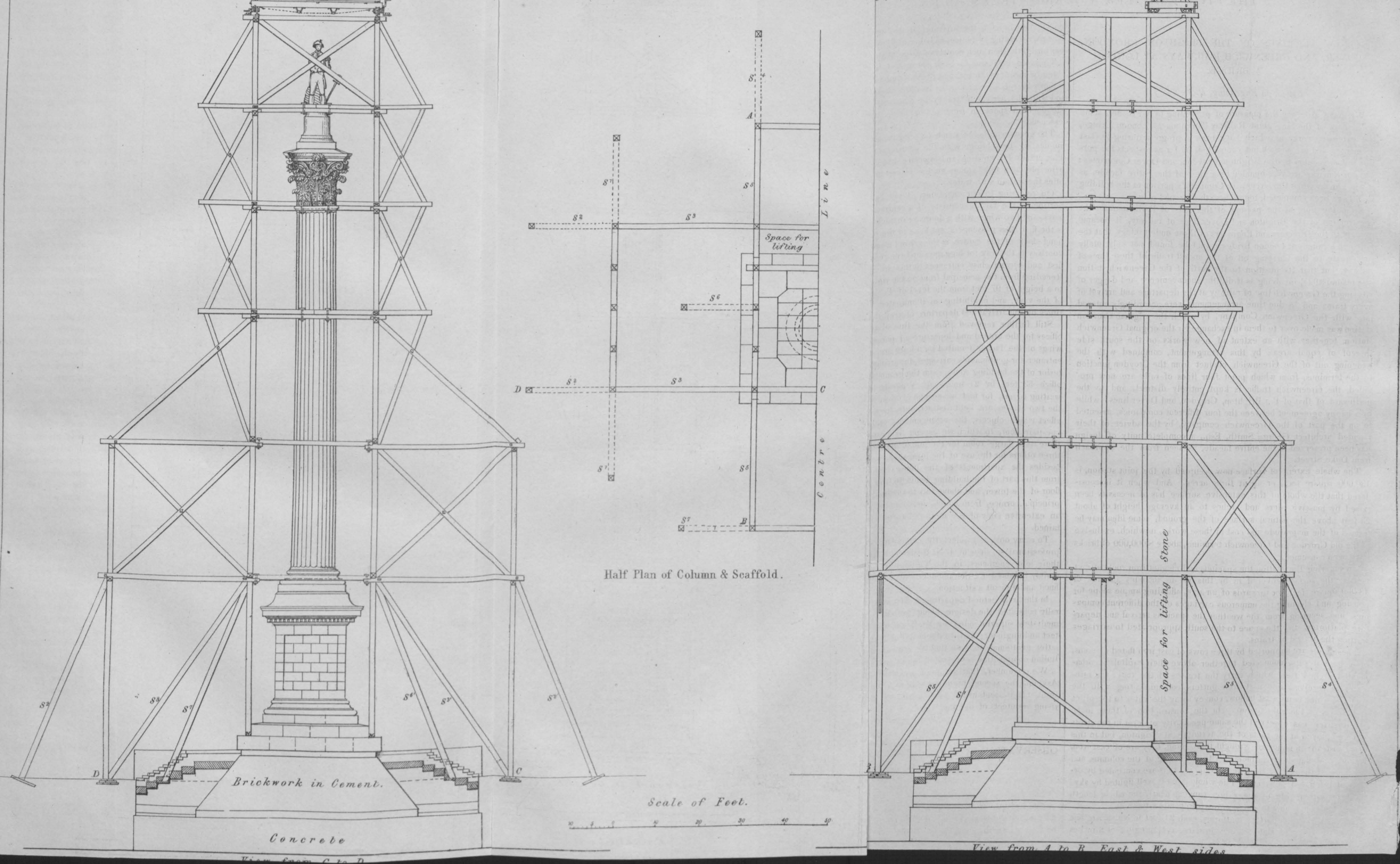
Architect, William Railton, Esq.

We feel much pleasure in being able to present our readers with some particulars as to the construction of this column, particularly with regard to the scaffolding, which is at once ingenious, effective, and of great strength, and at the same time of great simplicity; if our readers will turn to the first volume of the *Journal*, page 267, they will there see the drawing of the scaffolding adopted by Sir Christopher Wren, in the erection of the Monument of London: they will observe the immense quantity of poles used, and the mode in which they are put together with some hundreds of cords, so that this fragile scaffold is greatly dependent upon the tenacity of the cords; if one were to break while raising a heavy weight the whole would be in jeopardy of falling down.

In the scaffold before us there is no hazard of this kind, all the upright posts and horizontal beams are constructed of whole timbers, varying from 11 to 15 inches square: the posts are morticed at the top into the beams, and the latter are halved on each other at the angles; the struts S, springing from the ground up to the level of the first stage are also of whole timbers, about 11 to 12 inches square; the braces or struts of each upper story are of half timbers bolted together in the centre, and abut at the top with a mortice and double shoulder onto the posts.

The total height of the scaffolding above the level of Trafalgar Square is 180 feet by 96 feet square on the ground line, and contains 150 loads of timber. As each story of scaffolding is erected, the machine called the "traveller," a moveable crane or crab engine, is placed on the horizontal beams, and travels in the direction from A to B, on rails with a cogged rack, on the side laid on the top of the beams; and it also has a transverse motion on cross beams resting on a carriage, which travels upon the rails A to B; these cross beams also have rails with a cogged rail on the side, to allow the traveller to run in the direction from C to D: it is moved either way by gearing,

THE NELSON MEMORIAL & SCAFFOLDING.



consisting of a cog wheel, working into the cogged rail, attached to the machine by the aid of one man standing upon each stage. This travelling crane or crab, which has received some important improvements from Messrs. Grissell and Peto, is the most important machine a builder can have for erecting buildings where there is masonry; by it the stones are lifted off the truck, raised, and lowered immediately on to their beds, and adjusted with the aid of a mason and his labourer only, besides the two labourers with the machine, by which means great economy in labour is obtained. As soon as the erection is brought up to the level of the first stage, the next story of scaffolding is erected, and then the "traveller" is removed up to the top, and so on until the whole construction is finished.

This description of scaffolding was first introduced into use by Grissell and Peto in the erection of the Reform Club House in Pall Mall some three years since, and was found to possess so many advantages over the ordinary scaffolding made with poles, that it is not only used by them at the New Houses of Parliament and in all their other heavy contracts where masonry is chiefly concerned, but is coming into general use by other large builders, as at the Royal Exchange, Sun Fire Office, and the new Club House in St. James's Street. Its stability has recently been tested beyond all doubt at the Nelson Column, both as to its resistance to wind at a great altitude, and in its strength and steadiness while hoisting heavy weights. One of the parts of the statue of Nelson weighed 12 tons, and the load, although eight hours upon the scaffolding, did not occasion the most trifling vibration to be observable.

One of the advantages of this mode of scaffolding is, that the timber is all convertible for the building at which it may be used, as the scaffolding may be dispensed with as soon as the carcase is covered in, and it is generally used up in the internal carpentry of the building; the enormous waste in scaffold cords is also avoided as well as the considerable expence of a number of masons' labourers, who are always necessarily in attendance upon a scaffolding of the ordinary kind during its use.

Before we close this description of the scaffold, we must not forget Mr. Allen, the indefatigable foreman of the masons of Messrs. Grissell and Peto, under whose able directions the scaffolding of the Nelson Memorial was erected.

The foundation of the column consists of a bed of concrete resting upon a bed of gravel, upon the concrete is carried up brickwork of hard stocks set in cement; the column is solid and constructed of granite from Dartmoor, each course consists of seven blocks, one in the centre forming an oblong square, the others have the joints radiating from the angles and middle of the centre block, and each block is dowelled together vertically with slate dowels. The bell of the capital is also of granite, to which are fastened the enrichments and volutes, which are of bronze, executed by Mr. Clark of Birmingham. The cippus or pedestal upon which the figure stands is likewise of granite. The figure is sculptured by Mr. Baily, the eminent sculptor; it is of Cragleith stone from the Liver rock quarry at Granton in Scotland, belonging to the Duke of Buccleuch; it is of a dark brownish tint and very hard: it is in three parts, the lower block forming the plinth, the bottom part of the figure and the capstan at the back, which is represented with a rope coiled round it, is said to weigh 12 tons, and originally when the block was removed from the quarry it weighed 30 tons, and formed part of a block 45 tons weight in the quarry, (see *Journal*, Vol. V., 1842, p. 230 and p. 284.) The figure is fixed to the pedestal by a dowel of York stone 1 foot 9 inches long and 10 inches square, half let into the top of the pedestal and the other half into the plinth of the figure. The other parts of the figure are connected with similar dowels. The figure, we understand, has been coated with oil and wax, which gives it its present dark appearance, but it will ultimately get lighter.

The following particulars show the time occupied in raising the lower block of the figure, it was adjusted on the ground on the 3rd of November, at 5 h. 20 m. A.M.—it reached the first stage at 6 h. 45 m., second stage 8 h. 8 m., third stage 9 h. 25 m., fourth stage 10 h. 23 m., top 11 h. 20 m., total time six hours; it was removed horizontally from the end of the scaffolding to the centre in two minutes, and completely set in its place at 11 h. 45 m.

The landings and the steps surrounding the base are laid upon brick arches, and the plinths at the angles are to be surmounted with lions couchant, and the panels of the pedestal to be filled in with bronze bas-reliefs representing the heroic deeds of Nelson. In our 2nd volume, p. 279, will be found an engraving of the original design.

In conclusion, we cannot speak too highly of the manner in which the works are executed. They do the greatest credit to the establishment and enterprise of Messrs. Grissell and Peto.

Annexed we have given a table showing the measurements of the details.

DETAILS OF COLUMN.	ft.	in.	height ft.	height in.
Figure of Nelson	17	6		
Plinth of ditto	1	3		
			18	6
Cippus, or Pedestal upon which the figure stands, 7 ft. 6 in. diameter, ...	4	1		
Base of ditto, 8 ft. 8 in. diameter	3	5		
			7	6
COLUMN:—				
Abacus of capital	2	6		
Bell of capital in 4 courses, 16 ft. across the volutes	10	0		
Top course of column with annulus, 9 ft. diameter top of shaft	3	2		
10 courses below 2 ft. 7 in. each	25	10		
9 ditto 2 ft. 11 in.	26	3		
8 ditto 3 ft. 4 in.	26	8		
Lower course (10 ft. 6 in. diam.) including the upper torus of base	3	6		
Scotia and lower torus of base	2	7		
Plinth of base, 14 ft. square	1	10		
Height of shaft, base, and capital			102	4
PEDESTAL:—				
Scotia above	3	6		
Moulded cornice and dentill	2	3		
Bed moulding and upper course	2	3		
6 courses, 16 ft. square, 2 ft. 4 in. each ..	14	3		
Lower course and part of moulding ..	2	7		
Moulded base	2	2		
Plinth under ditto, 22 ft. square	2	8		
Height of Pedestal			29	8
Top step below pedestal, 27 ft. 6 ft. square ..	3	0		
Lower ditto 33 ft.	3	0		
Height of two steps			6	0
Solid brickwork in cement to foundation of column, 52 ft. square at base, 1 ft. 6 in. high, then gradually diminishing all round, 12 ft. 6 in. high to 33 ft. square, then 1 ft. 6 in. high; total height of brickwork			15	6
Concrete 80 ft. 6 in. square			8	0
Total height, including foundation, ...			187	6

The foundation rests upon a firm bed of gravel 12 feet below the foot paving of Charing Cross, or 16 feet 6 inches below the level of Trafalgar Square.

Surrounding the base of the column there is to be a landing 10 feet 6 inches wide, and 10 steps 80 feet square at the bottom, in all 7 feet high above the level of the paving in Trafalgar Square, making the total height of the column above this level 152 feet 6 inches, and including the figure 171 feet.

The height of Pompey's Pillar is 90 ft.; Trajan's Pillar, 115 ft.; The Monument of London, 202 ft.; The York Column, 138 ft.; The Nelson Monument at Dublin, 134 ft., and at Yarmouth, 140 ft.; Napoleon Column at Paris, 132 ft.; July Column, 157 ft.; and the Alexander Column at St. Petersburgh, 175 ft. 6 in.

CANDIDUS'S NOTE-BOOK.
FASCICULUS LIV.

"I must have liberty
Withal, as large a charter as the winds,
To blow on whom I please."

I. Why anonymous criticism should be a whit more odious or more indefensible upon architectural topics than any other, it is difficult to understand; yet so it seems to be considered by some folks—who would probably be for abolishing criticism altogether, being conscious of having very little favour to expect from it. Admitting the system of anonymousness to be ever so reprehensible—what then? It was not architectural writers that brought it up; they found it already established, and that so far from being considered disgraceful, it was one which our most eminent writers had supported by their talents. Anonymous criticism may be stupid, but then censure its stupidity, not its anonymousness. At any rate it does not attempt to bias the reader's judgment by the *prestige* of a name, and so far its stupidity is honest and is harmless.

After all, too, is anonymous criticism invariably so dreadful as some would have us believe? Has Barry had any cause to complain of its severity or its unfairness? or has it never done justice to the productions of others in the profession? Aye! but then, it will be said, that it is because it pays deference to names, and takes its *cue* from popular opinion. Does it? Egad! John Nash and Robert Smirke would tell quite a different tale; they would say that it pays no respect to names—at least not to theirs, which it has treated very unceremoniously. We must have either anonymous or milk-and-water criticism, unless we choose to resort to the only other alternative, of having none at all—the last, no doubt, a consummation devoutly to be wished for, in the opinion of those excellent people whom criticism never praises, and never instructs or warns.

II. We are congratulating ourselves upon having reached a new epoch in art, at having entered upon the Victorian era of it, when it is to blaze with a lustre yet unknown. Fudge! What if a "morning star," as Pugin calls it, be rising at Westminster, all is Cimmerian darkness at Bloomsbury, where Smirkean night- or knight-hood is suffered to reign supreme. Most certainly all the proceedings connected with the Museum buildings have, up to the present moment, been kept shrouded in impenetrable mist, mistiness, and mystery. Not even a single one of the enlightened and vigilant guardians of art, or of those who compose Fine Art Commissions, has thought fit to bestir himself on the occasion, and drag the matter formally before the public, in spite of Peel and his prophecy. It might be thought that Peel has had a sufficient dose of Smirke at Drayton Manor; or if he is really satisfied with that as a specimen of architectural genius, his opinion in matters of architecture ought to pass for nothing. Nevertheless, all seem to stand in awe of the prime minister and his pet: and, strange to say, even the great John Britton himself, who has always caught at every opportunity of thrusting himself before the public *in propriâ personâ*, has not come forward with an "*Address*" to any one, individual or body, on the subject of the British Museum!

III. It is impossible for any one to say of Sir Robert Smirke, that he is a temporizing or time-serving man, since, instead of at all bending to the spirit of the present times, or complying with its humour, he stands out resolutely against it, and shows himself a staunch conservative in maintaining that system of monopoly and irresponsibility under which he has *flourished*. The public is to him just the same ignoramus, insignificant public as it was some thirty years ago; whether it brays forth its approbation or its censure is to him matter of utter indifference. Very likely, therefore, he smiles with contempt at those—and some there are—who would fain coax him into showing some kind of deference to public opinion. Most sulkily serene, Sir Robert pays no attention either to such cajolery or to reproach. Why should he now be called upon, for the first time, to satisfy beforehand the prying curiosity of an impertinently inquisitive public, after having erected so many public edifices without being subjected to any such ordeal or *surveillance?* Reasons, however, there may be, although they are not obvious to himself, and one of them is, because such matters have begun to be put upon a somewhat different and more liberal footing than formerly; nor has the confidence reposed in the public hitherto thwarted schemes of improvement, for the public has generally urged them forward and encouraged them. Another reason wherefore the architect of the British Museum should be called to give some pledge that that edifice will, when completed, be both satisfactory and creditable to the country, is that no such assurance is afforded by any or all of the buildings he has hitherto executed; since, so far from serving as testimonials of superior talent, they rather amount to a positive DISQUALIFICATION on an occasion like the present, one of unusual importance, and all the more important because no similar one can occur. It is true other museums may be founded in different parts of the country, and some of them may be, if less extensive, nobler works of architecture; yet they will not be *The British* Museum; and however gratifying it may be in itself to behold such structures, it must at the same time be not a little mortifying to find that the metropolitan and national one is quite eclipsed by them in architectural style and design. There are some who might still avert the mischief, but they evidently do not care to interfere, fearful, perhaps, of giving umbrage to another Sir Robert who stands as sponsor to Smirke's museum. What are the royal and noble patrons of art about, that not one of them can spare a moment to bestow a thought on the unfortunate edifice in Bloomsbury? Is there not one of them all to come to the rescue, and to avert from that structure the sad inglorious fate of being doubly *Bobbyfied*.

IV. And what says that very respectable old gentlewoman, Dame Sylvana Urban, on this occasion? What is the old lady's opinion as to the goings-on at the British Museum? Ah! Dame Urban is a cautious body, and she therefore does not care to risk giving umbrage to any powers that be: so that, if her opinion be worth having, we may guess, from her very discreet silence, of what kind it would be; for could she squeeze it out of her conscience to take the part of Smirke's handywork in Bloomsbury, what a cackling about it there would be! However, if intolerable as a specimen of any other, the British Museum will, no doubt, prove a very respectable sample of the *Milk-and-water* style, yet as such superfluous, as we have quite samples enow of that already.

V. Even royal taste is sometimes grievously at fault, and what is more, is grievously found fault with. Thus was it with the Albert military hat, which the gentlemen of the army protested against as a vile deformity. And if princes can err in matters of taste, *à fortiori*, so also may prime ministers, consequently Sir Robert Peel's recommendation of another Sir Robert's design, according to him the very *ne plus ultra* of architecture, ought to stand for nothing. Sir Robert Peel may be a very good *cabinet*-maker, Sir Robert Smirke an excellent warehouse-builder; but let them stick to those trades, and not foist upon the country such a dowdy design as the one concocted for the British Museum out of the Post Office and the Custom House. Any Pecksniff would have produced something as good, and just as "*respectable*,"—for some, it seems, have expressed themselves ready to be satisfied if what ought to be rendered a magnificent national work, can be patched up into something "respectable," in other words, be made a *tidyish sort of a job*—so much for the March of Art in England!

VI. One of the most extraordinary excuses ever put forth on any occasion, is that which has been assigned on the part of Sir Jeffry Wyatville, for the entire omission of any plates of the interior in his "Illustrations of Windsor Castle," for the reason that that part of the fabric may undergo considerable alteration in the course of time: a very strong reason, one would imagine, for such illustrations being given, not merely as present studies, but as faithful records of his own work, should it at any future period be destroyed, whether by being changed into something else, or by being burnt down. Would the illustrations he has given us, lose at all in interest or value, were a conflagration to sweep away the whole of the pile? How many buildings there are, in respect to which nothing, or comparatively nothing, can now be learnt, because authentic and sufficient memorials, taken at the time, or when they were in a perfect state, have not been perpetuated by the graver. All that we now know of James Wyatt's *chef d'œuvre*, rest merely upon tradition and conjecture, perplexed rather than aided by paltry views, which leave us quite at a loss as to the superlative beauty and magnificence claimed for the structure in terms of eulogium that read like newspaper puffs.

VII. Now that symbolism is come into vogue, it is odd that no one has yet protested against the monstrous paganism and heathenism of the Nelson column or any other of the kind, as being evidently derived from monuments of Phallic worship, consequently not unmeaning, but on the contrary, pregnant with a meaning that will not bear to be explained. It is true symbolism does not scandalize in such cases, because no one sees or understands it; and, for a similar reason, other symbolism may be equally unavailing.

VIII. It does seem strange, that with a frontage of not much less than 150 feet, the architect of the new Conservative Club House, should not have placed the entrance in the centre of his façade; or if circumstances absolutely compelled him to place it at one end, it should not have been within a recess. There is, indeed, something corresponding at the other extremity of the front, yet not sufficiently so as to preserve symmetry, and even were such the case, gaps of this kind at the angles of the ground floor, where the expression of strength and solidity is most of all desirable, would be a defect detracting very much from whatever other merits and good points there may be in the design. Perhaps the architect was determined that it should be impossible for any one to say that he had copied—or, indeed, looked at Barry; so resolved, *coûte qui coûte*, to give us a specimen of something altogether different, and therein he has certainly succeeded.

IX. A good deal of sentiment and pathos has lately been expended upon the quondam College of Physicians in Warwick Lane, and that venerable piece of rubbish ycleped Old London Wall. Yet it might be better, if instead of all this Parthian retrospectiveness, these long and lingering glances backwards at antiquity—a lady called by the poets "hoar antiquity"—it might be better and somewhat more to the purpose to pay greater attention to the future, to look forwards a little more than we do, and bethink us what sort of figure we ourselves shall cut in the eyes of posterity. While people are moralising, poeticising, fantasticising, on some sturdy remnants of old brick and mortar somewhere in the ultima Thule of the metropolis, they have no eyes at all for the portentous operations now going on in Great Russell Street. At any rate they have no voice that exclaims against such doings, and their eyes they employ merely to wink at them. It might be supposed that the Museum was a mere parish job, which concerned the good folks of Bloomsbury, or the "Bloomsbury barbarians," as Hook used to call them, alone; and with which no one else has any right to meddle or make. Infinitely better would it have been to have kicked out Sir Robert at once, and plaistered him with a good round pension, which last would, no doubt, have convinced him that if he abandoned the field to another, he had made a masterly retreat for himself, and could enjoy, if not *otium cum dignitate*, his *otium cum pecuniâ*—a far better thing still. How he came to be appointed architect at all to the Museum, puzzles many; and pity it is that the appointment was not made a complete sinecure to him, some understrapper, some "*Pinch*" being employed, as the great man's proxy. As matters have been managed, Sir Robert will not be able to find any convenient *sub* or proxy, who will bear for him the disgrace he is now bringing upon himself. It is true the building is not yet done, yet it is now completely "done for."

X. Thank heaven! though literature is now for the most part reduced to a mere manufacture, art is not yet workable by machinery, although some of those who call themselves artists are in themselves no better than machines, with about just the same intelligence of and affection for it as the implements they handle. They have one or two patterns, which, either through laziness or incapacity, they apply pretty much in the same way on all occasions, no matter under how widely different circumstances. No wonder, therefore, that at the very best no more than mere decent mediocrity and insipid, flavourless common place are the result. How should that possibly be expressed which is not felt? How should there be aught of genuine and genial feeling where every thing and every part is concocted out of second-hand and borrowed ideas, and those perhaps very ill understood? I have met with architects who might have been very clever as masons, but who have had no more notion of art or of the poetry of art than an Irish labourer, although able to talk more glibly about Vitruvius and Palladio. Well! those are just the sort of people to admire the British Museum—perhaps, to build one.

XI. It is cleverly remarked by a German architectural critic, that it is generally considered quite enough to provide sufficient light in a building, no matter whether there be any *effect of light* or not. Artist-like study and treatment in that respect are, indeed, hardly to be looked for in ordinary houses or in mere sitting-rooms; but neither on we find anything of the kind in superior ones, except on very extraordinary occasions, and partly arising out of mere accident. One may go over a large mansion containing numerous and most sumptuously furnished apartments, without being struck with a single effect of the kind in any part of it, or any thing whatever that amounts to character and effect purely architectural. One sees what the maximum of cost and the minimum of imagination if not exactly of taste, can accomplish; and even if there be nothing calling for particular censure, there is nothing to enchant by novelty of effect, or by decided individuality of character. As for any peculiarity of arrangement, that might as well be looked for in the London stereotype front and back drawing-room, or in a row of ready-made speculation houses. A good deal has been said lately about "architecture for the poor!" but it would be hardly less charity to think of architecture for the rich—for those who are obliged to conceal the utter architectural nakedness of their mansions by the mere trappings supplied by the upholsterer, displaying most ostentatiously the costly poverty of their taste, and the paucity of their ideas. Exceptions there are—though not in our royal palaces—and I lately beheld one in an apartment which, though not very large, and rather sober in regard to decoration than otherwise was most striking for its high degree of architectural beauty, and the very peculiar kind of it, arising both from unusualness of plan, and from the mode of lighting, and the charming effects attending the latter. So replete, indeed, was it with beauty of such kind, as to possess a variety which nothing can stale. From almost every point a new picture—a fresh combination as to perspective, is presented. It should be observed, however, that this is an entirely *con amore* work, planned by the proprietor himself. It may be wrong for amateurs to turn architects; one consolation is, there is very little danger of architects turning amateurs, and giving more study to an episode in a plan than they now do to a whole building, though it be one as big as the British Museum—whose merits are all summed up in that little word.

SOME OBSERVATIONS ON THE ANCIENT ARCHITECTURE OF THE EGYPTIANS.

In the very earliest ages of the world, man must have directed his attention to the art of building, as habitations were indispensable, not only for comfort, but also for protection; the necessity for some defence against the parching heat of the sun, the power of the elements, the ferocious attacks of wild beasts, and the treacherous assaults of fellow man must have been early experienced, and the rational faculties with which the Deity had gifted him, must at once have been called into action to accomplish this desirable object. These buildings, on account of the roving lives which their occupants led, were constructed of very slight materials, and must naturally soon have fallen a prey to the destructive hand of time. To expect, then, after a lapse of some thousands of years, to find any remains of those primæval buildings would be most absurd; but from observing the practices of men, now in an uncivilized and primitive state, as well as the authority of the earliest records, we have very strong presumptive evidence of what must have been the first dawning of architectural science.

It is recorded by the author of the Pentateuch, that Cain built a city, and called it Enoch, after his son. This town, being a collection of huts, probably constructed in the manner of those now to be seen among the savage Indian tribes, fell to decay, and no vestige of those buildings now remain, to mark their former existence. The progress of building must have been rapid, [and the art of carpentry well understood, to have enabled Noah to construct the Ark, which, with its heavy freight, was for many days exposed to the tossing of the billows, and the rage of the elements. The subsequent design of the Tower of Babel, and the extent to which the proposed work was carried into execution, must convince us, that even at that early period, architectural knowledge had greatly advanced.

Satisfactory, however, as may appear those records which mark the progress of intellectual refinement in the early ages of the world, still historical evidence alone can be of little practical utility to the modern architect; to the examples of the most ancient existing ruins, must he recur, to trace the features of the science in by-gone days: and in this investigation, three countries present their claims for the palm of originality, Egypt, Hindostan, and Persia, where architectural remains of great magnificence are now to be seen, gracing their almost tenantless plains, the admiration and astonishment of the most enlightened travellers and antiquarians.

As to which of these three countries we are indebted for the first degree of perfection in the architectural science, there are very numerous and conflicting opinions, and seemingly strong evidence has been produced on each side. A strong argument in favour of the Egyptian style is the very great simplicity of design observable in all their edifices. Although the leading features of the ruins in the three countries are similar, yet it is easy to perceive, from the drawings which we have of some of them, that the simplicity of the Egyptian has in some measure been departed from in the Hindostan edifices, and that the introduction of circular outlines bespeaks a certain degree of perfection in the art of designing, unknown to the architects of Egypt; and the delicate pillars and refined ornaments of the Persian architecture prove a still further progress in that science, which must have originated in simplicity. The simplicity of style, in the absence both of tradition and historical records is evidence, the validity of which cannot be contended in favour of Egypt having been the nursery of scientific architecture, and to her the kingdoms of the East are indebted for those edifices "of other days."

In examining the progress of architecture in this country, we are altogether left to draw our conclusions from conjecture: for in vain is the page of ancient history scrutinized; in vain are the present occupiers of this mysterious land consulted about those remains of the by-gone glory and forgotten wisdom of their forefathers. No clue to solve the hidden mysteries of those sacred temples; no recording monument to satisfy inquiring posterity; ages have gone by, time has rolled on, many generations have been called to their final account; still those massive ruins mock the power of time, pointing out a locality, where, in centuries long since passed away, science and art had their votaries, and the torch of wisdom burned brightly in those very regions, where in latter times, ignorance and gross darkness have sprung up.

Little reflection is required to convince us that those stupendous works of Egypt are not the production of men, to whom the first principles of science alone were known, or that those almost super-human structures could be the results of merely infancy in the arts. The progress of architecture must have made rapid strides, and some centuries of practice must have passed away, before such perfection could have been attained. It cannot possibly be supposed that men, whose greatest knowledge of building consisted in the erection of huts, could at once design edifices of such enormous dimensions and great solidity, calculated to withstand the ravages of time, and the erection of which must have occupied many years; or that an ignorant people could have devised the means of quarrying and dressing those large masses of stone, or placed them in their present positions, which even now, with our advanced knowledge of mechanics, and great improvements in machinery, we should consider almost impracticable. To a very mature age of architectural knowledge must those ruins be attributed.

The discovery, which it is stated Mons. Denon made at Thebes, of a stone covered over with hieroglyphics, and which, from its appearance, was evidently the ruined part of some more ancient temple, forming a foundation stone to one of those now standing, has been fairly adduced, as a proof of Thebes having been, at some much earlier period, adorned with temples and other public buildings, which must have either fallen to decay, previous to the erection of the present ruins, or been taken down to build those more ornamental edifices.

In that mysterious region, where now, surrounded by the scattered ruins of pyramids, temples and cities, the savage shepherd tends his roving flocks, once studied the author of the Pentateuch, and freely imbibed the wisdom of ancient Egypt. In that same district, where those remains of antiquity attest the departed refinement of the Egyptians, in other days Plato instructed his auditory, and Euclid wrote. Amid these ruins, the remains of three different forms of structure are to be observed, the pyramid, the temple, and the tomb or cavern.

To which of these the date of priority in construction is to be assigned, is a very difficult question to decide. Arguing from analogy, it would be reasonable to suppose that nature first pointed out to uncivilized man, the cavern, as the best form of habitation; but the superior workmanship observable in the interior of those excavations must at once dissipate this idea, and the refined and well executed sculpture on the natural rocky walls must be attributed to an advanced era in the art. The simple form of the pyramid, as not requiring great talent in designing, may be adduced as a proof of the priority of this structure; but the fact of these buildings being found only near Memphis, the city which historical records assert was built long after Thebes, must cast a great doubt upon the validity of this claim. The complicated form and skill required in both designing and executing the temples, presents a strong barrier to the supposition of priority of construction in these buildings. The absence of historical evidence on this point, leaves this subject altogether a matter of conjecture.

Those stupendous erections, the pyramids, which have withstood the destruction of time, for more than three thousand years, in external appearance may be said to be deficient in architectural character, and no beauty in design can be attributed to them; still, from their enormous dimensions, their colossal appearance, the massive materials used in their construction, and from the well executed workmanship, they must attract our admiration, and be justly numbered among the wonders of art. The description which Herodotus has given of the mode of construction of the pyramid said to have been built by King Cheops, must naturally lead the reader to view with astonishment, that stupendous erection and the circumstances which he mentions, of the building of this pyramid having occupied 100,000 men for 20 years, may be well adduced, as proof of the devotedness of the ancient Egyptians, to works of art.

The building which possesses most architectural character, and may be said to be the very basis of ancient architecture, considered in a scientific point of view, is the Egyptian temple; and though on first observing the peculiarity of the style, we may be led to form, perhaps, an unfavourable opinion as to its merits, still when it is kept in recollection that those people had no models to copy, or no design to borrow from other nations, but depended altogether upon their own resources, and followed nature as their guide, we must banish all unfavourable reflections, and award the well merited laurel to the authors of the science. The characteristic features of these temples are the colossal form, the enormous size of the blocks of stone employed in the execution of the works, the tapering walls of a pyramidical form, the pillars of vast dimensions, and the arrangement and disposition of the several parts of the building.

In the columns, the change of outline seems to have been considerable. The simplest form appears to be a representation of a bundle of reeds, bound together near the top, with a cord wound round them several times, having a square flat stone laid on their top: they are made to bulge out a little below the binding, in order to imitate the effect which would be naturally produced in a bundle of reeds, subjected to a pressure in a vertical direction.

In the Egyptian pillars, massive and heavy as they may appear, can be traced many of the features of those refined Grecian columns, which by all writers have been justly eulogised, and to which, too frequently, and very unjustly, the claim of originality of design has been yielded. The very striking analogy which exists between the examples of the two countries, must be very apparent, upon examination.

In the plain and simple pillars of the little temple at Luxor, resembling in form the trunk of a tree, we may behold the origin of the heavy and tapering Doric shaft. Other columns, representing a bundle of reeds, placed in a vertical position, and bound round at the top, bear a strong resemblance to, and most probably furnished the first idea of the fluting of those shafts so ornamental in the Grecian copies, while in the binding of the reeds we may easily trace the astragal and necking of the column. The square flat stone placed on the top of the pillar, and the Grecian abacus are synonymous, while the flat stone upon which the Egyptian columns rests, fully accords with the plinth of the Athenian column. The absence of the plinth in some of the pillars of the Egyptian temples, probably prompted the architect of the Parthenon to observe the same omission. The swelling shaft in the temple of Karnac, suggested the similar form in the Grecian Doric. The introduction of human figures in the place of columns at the Memnonium, certainly dictated to the Greeks the similar application in some of their edifices, which they, claiming the originality of the design, called Caryatides. The most eminent writers assert, that this design was derived by the Greeks, from the Carian slaves carrying on their shoulders heavy burthens, and hence the name; but certainly the similarity between these figures, and the more ancient ruins of Egypt, could not have been accidental. The capitals of the columns of the Temple of the Winds at Athens, bear a very strong resemblance to those of the temple of Appolonopolis. This strong analogy might be pointed out to a much greater extent, but sufficient has been adduced to establish the existence of the similarity.

In Egypt, then, may be traced the characteristic features of many of those splendid temples, which Athens boasts, and which have justly attracted the admiration of the world. To the Egyptian ruins, we owe many of those ornamental details of Grecian architecture, which the practice of centuries perfected, and which all the talent of succeeding ages could not improve. But why almost all authors award the palm of originality, and attribute the cultivation of the first principles of architectural knowledge, to Greece, seems a problem exceedingly difficult to be understood. Why, while merit and praise is heaped, and justly too, upon the perfectors of known principles, should we deprive the authors of their well-deserved mead of admiration? and while we, in some measure, and to a certain extent, agree with many writers, that taste and beauty of design are the attributes of the three orders of Grecian architecture, should we go the lengths which they would wish us, and brand those stupendous monuments of the by-gone glory of Egypt, as the very infamy of taste, or as Strabo has pronounced them, "barbarous monuments of painful labour."

It is not to be wondered at, that during the long period, in which architecture flourished in Egypt, greater progress was not made, and a greater diversity of design observed, when it is remembered, that to the management and supervision of the priesthood these erections were entrusted. This religious scruple and bad selection of superintending power altogether tended to curb the talent of the people, as the science was placed in the hands of a body of men, whose profession must have chiefly engaged their attention, and who, if ever possessed of architectural taste, were themselves so restricted by forms, as to render that taste useless.

F. V. C——, A.B., Arc., C.E.

Dublin, 13*th Nov.*, 1843.

ANCIENT STRUCTURES IN WINCHESTER AND ROMSEY.

By Mr. George Godwin, F.R.S., &c.

It would be difficult to name a locality more interesting to the architectural antiquary and the lover of old memories, than Winchester and its neighbourhood. It is connected with some of the earliest events in our history, and with many of the most eminent men of past time, who have left there enduring monuments of their own energy and ability, and of the prevailing spirit at particular periods of time. Thanks to steam and engineering skill, which in several respects may be said to have doubled the length of man's life,[1] Winchester, although 64 miles from London, may be reached in two hours and a half, so that there is now little difficulty in paying it a visit.

A history of English architecture might be illustrated very satisfactorily from the Cathedral alone, in addition to which there are the College, the city gates, the County Hall, the Market Cross, the remains of Hyde Abbey, two or three parish churches, and the Hospital of St. Cross,—which are all full of interest and instruction. As I have said again and again, architecture has a history more exciting and instructive than half the moral essays and poetical fictions ever penned: it is, in fact, the history of society written in brick and stone.

The age of some parts of Winchester cathedral has excited controversy, nor is the question yet settled. The original foundation of a cathedral here is ascribed to the second century; the structure then raised was rebuilt at the commencement of the 4th. In the middle of the 7th century it was again renewed by Kenewalch, an intimate friend of Biscop (by whom the arts in England were much advanced), and in the 10th century Bishop Ethelwold rebuilt great part of it. The present cathedral was commenced by Bishop Walkelyn in 1079, and dedicated 14 years afterwards: and according to the generally received opinion the crypt, the tower, transept and font, belong to this era. Mr. Garbett, however, and some others, have thought that portions of the structure are of an earlier date than this; nor can I entirely refuse to coincide in this opinion. The tower, Rudborne, the Winchester annalist, states repeatedly, is the work of Walkelyn. That part of the north transept which adjoins it is seen, from the execution of the masonry, to be of the same date; but the remainder of the transept more northward has a widely different appearance, and is unquestionably the work of a different period. The mortar joints are considerably larger and the execution altogether ruder; nor is the design exactly the same, or the parts of the same height, so that management was required (and is evident) to bring the two portions satisfactorily together. My excellent friend Mr. Britton,[2] in his History of Winchester Cathedral, considers "this might have arisen from different workmen who were employed, even at the same time, and still more from those who were engaged on the church at different periods of its erection, for it cannot be doubted," he continues, "that an edifice of this size must have been some years in progress, and that many masons were unquestionably employed in its construction." With the greatest respect for the opinion of our veteran topographer, and every disposition to look with caution at any assumption of remote date, I am unable to think this argument conclusive in the present instance. If this difference in the workmanship had appeared *horizontally* throughout the building—if the lower story presented one appearance, the upper part another—this opinion might be tenable; but in the case before us, the difference is perpendicular, it is throughout the height of a particular portion, not the length of the whole; and before we can admit that the diversity of construction which is apparent, results from the different workmen who were engaged on the church at different periods, we must believe that one half of the north transept was completed before the remainder and the tower were begun.

The statement of Rudborne, too, which is urged as proving the entire rebuilding of the church by Walkelyn, is not sufficiently conclusive to destroy an opinion founded on what we see before us. He says that Walkelyn, *a fundementis cœpit reædificare;* words which, if I mistake not, have been used by chroniclers in some cases where it was known that much of the previous building had been allowed to remain, although the whole had been reconstructed even from the ground. In fact, that some part of the old cathedral at Winchester was allowed to stand, seems clear, from the continuation of Rudborne's own narrative; for he goes on to say that within a year after the completion of the new building, the Bishop's men destroyed the old monastery, *excepto portico uno, et magno altari,* or, as Milner words it, "leaving nothing standing at the end of the year except the high altar and *one porch*, which seems to have been the corresponding part, or eastern end of the cathedral church." The word *porticus* has a doubtful signification, but unquestionably means more than what we should now call a porch.

In pursuing this investigation, there is another circumstance recorded which must not be lost sight of, by which (if other discrepancies could be removed) the difference of workmanship in the transept might be explained. The eastern end of the church (which Milner considers was of Saxon work, left by Walkelyn) had become dilapidated in Bishop Lucy's time, and that prelate determined to rebuild it, beginning with a tower. In the year 1200, according to Rudborne, this tower was begun and finished. It does not seem probable that the centre tower was here referred to; it would be inconsistent with other of the annalist's own statements, and moreover the style of the architecture is clearly anterior to that date. Garbett considers it was a tower at the eastern end of the choir. The whole matter, however, is wrapped in doubt, and it would be safer to say that one portion of the transept was early Norman, the other late; but for my own part, I can hardly avoid considering that the northern extremity of it may be anterior to the conquest.

The effect of the transept, massive and grand, is very striking, and will well repay attentive study; the arrangement of the aile at the termination north and south, is peculiar. The elegant nave, of a very different period, and consequently with a very different aspect, is the work of William of Wykeham, commenced about 1393, when he was seventy years old. It affords some excellent examples of "perpendicular" Gothic, as, indeed, do many other parts of the cathedral. Recent repairs have served to prove that much of the old work was allowed to remain by Wykeham, and was cased and altered.

[1] The magnitude of the cuttings and embankments which form the railways of Great Britain, looked at as a whole, is enormous, and would seem the work of ages; yet all this has been effected within a very few years, *by single spadefuls!* Continued efforts, however small singly, work wonders.

[2] Mr. Britton, to whom every student in architecture, and many beside, are deeply indebted, celebrated in July last his 72nd birth-day. Time has in no way diminished his energy or ardour, or lessened that kindness of heart which has led him, throughout a long and useful career, to offer a friendly hand to all whom he thought deserving. Honour be to him!

In sepulchral chapels Winchester cathedral is particularly rich, especially in those of the perpendicular period. The eastern portion of the building, behind the altar, is a perfect *rendezvous* of monuments, perhaps unequalled, and must be seen to be duly appreciated. Bishop Fox, Bishop Gardiner, Bishop Waynflete, and Cardinal Beaufort, have chantries here; Wykeham's chantry and Edington's are in the nave. A sculptured figure in a *vesica piscis* has been recently affixed to the east wall in the north transept. It seems formerly to have been loose in the cathedral, for it is represented on the ground leaning against a pillar, in one of the plates in Mr. Britton's history.

The most interesting of the parish churches in Winchester is St. John's. It consists of chancel, nave, and side ailes, and has a tower at the west end of the north side. This structure contains most of the features which distinguished our places of worship "while yet the church was Rome's," and concerning which all information is now sedulously sought. Where the rood-loft formerly stood to separate the chancel from the nave, is now placed the organ gallery—most improperly. The staircase by which the priest ascended to the rood loft is in a turret against the south wall of the aile, with a doorway in the wall; over the aile there was formerly a gallery or passage way to the loft, with openings through the spandrels of the main arches. There was an external entrance to this turret, which was probably used as the "priest's door" to the church.

Two projecting walls from the east end separate the chancel from the ailes, and in that on the south side is one of the small, oblong apertures, opening obliquely to enable those persons who were in the aile to see the elevation of the host, and which have been termed *hagioscopes*. If my memory is right (I have no note of it) this was adapted to serve also as a piscina, an arrangement not uncommon. In the wall on the north side there is a similar oblong opening inclined the reverse way, so as to admit a view of the east end of the north aile, where there is a handsome altar tomb against the north wall, with a recess above it, which may have been used as an Easter sepulchre. If so, lights were kept burning in it during the latter part of Passion week, and the opening in question may have been made to enable the attendants readily to watch them. On the side and end of the tomb[3] are shields, one bearing the five wounds, another the instruments of punishment, and a third the letters I. S. entwined, standing probably for *Sanctus Jesus*, or *Jesus Salvator*. Returning an instant to the chancel, there is one sedile and a piscina on the south side of it. It may be well to remark that although I have described the church in this memorandum as standing east and west, the altar points in reality to the south east.

At the church of St. Peter, Colebrook (at the same end of the city as St. John's) where the tower is at the south-east corner, there seem to be remains of enriched ridge-tiles. The font is square, supported on a central pillar with four smaller pillars at the angles, similar in plan to the very interesting specimens of Norman fonts at the cathedral, the church at East Meon, and other places also in Hampshire.

The County Hall, formerly part of the old castle, although now encumbered by the Assize Courts, has many points of interest. Milner calls it, "the ancient church or chapel of St. Stephen;" but Mr. O. B. Carter, architect, who has examined this building lately, and has prepared plans for its restoration,[4] considers that it was always used as a Hall. It is in three ailes divided by clustered columns and arches, and must have formed a magnificent apartment.

The Hospital of St. Cross, the "alms-house of noble poverty," which stands about a mile from the city, retains more fully its ancient appearance and customs than any similar establishment in the kingdom. The brethren with their black gown and metal cross on the left breast, the dining hall with the old "black jacks" for ale, and other implements given by Cardinal Beaufort; the quiet cloister, the ancient church embowered by trees, and the pretty residences of the brethren around it, serve to take back the mind to a much earlier period in our history, and to induce the thought that in a rude and violent age the monastery—which St. Cross, though never so used (being simply a hospital and a refuge), closely resembles—must have offered strong attractions to all studious or timid men, who were unwilling or unfitted to encounter in the world the more boisterous spirits of the time.

Originally, besides the resident brethren, 100 miscellaneous poor were fed daily in what was called, in consequence, "Hundred-Menne's Hall," but is now a brewhouse. At the present time all who apply at the gatehouse may receive a horn of beer and slice of bread, that is until two gallons, the day's allowance, have been expended; nor are the applicants for this, few.

[3] I call it a tomb, because there seems to have been an inscribed brass around the top edge of it.

[4] Mr. Carter has recently erected the Alms-houses of St. John, in Winchester, for 14 inmates. They form a tasteful pile, and cost £3600.

Cardinal Beaufort, of whom Shakspeare says, in the bitter picture he drew of him,

> "Henry the Fifth did sometime prophesy—
> If once he come to be a cardinal,
> He'll make his cap co-equal with the crown;"

expended much money on St. Cross, amongst other charitable establishments, and erected many of the present buildings.

The church, commenced by Henry de Blois, brother of King Stephen, about the year 1136, is an interesting specimen of a transition period in architectural history, when the semi-circular arch was about to give place to the pointed. It has acquired considerable notoriety from the circumstance that Dr. Milner, following a suggestion thrown out by the Rev. J. Bentham,[5] has appealed to the interlaced semicircular arches in the choir, where pierced for light, as being probably the first open pointed arches in Europe. The origin of the pointed style of architecture is still as doubtful as it was before the appearance of any of the numerous dissertations to which it has given rise. Nevertheless, the inquiry cannot be deemed useless: as in the pursuit of the philosopher's stone and *elixir vitæ*, the enthusiast alchemist discovered many new substances and enlarged the science of chemistry, so, in the vain pursuit of the origin of the pointed style of architecture, much valuable information has been gathered.

Whichever theory may be the most correct, it is certainly not that deduced from the intersecting arches at St. Cross. Apart from less obvious objections to any deduction founded on the present appearance of this arcade, the main arches in the choir, *below* it, are pointed, as too, is the vaulting of the aisles; by which we must be led to believe either that considerable alteration was made in the choir at a later period, when the practice of the pointed style was more advanced, and which might have extended to the interlaced arches in question, or that the date of its original construction is somewhat more recent than that usually assigned to it. Moreover, other structures in England, the date of which is asserted to be even anterior to that of St. Cross, as, for example, Buildwas Abbey, display likewise an intermixture of pointed and circular arches. The circumstances, however, which occurred in many cases to delay ecclesiastical buildings for years after the recorded date of their foundation, and the difficulty of detecting alterations and reconstructions made at a remote period, prevent us from arriving with any certainty at a satisfactory conclusion.

At the south side of the altar at St. Cross there is a table of prothesis, or credence, on which the bread and wine were placed previous to the offertory, and the introduction of which in modern churches is strongly insisted on by the Cambridge Camden Society. There seem to be very few ancient examples remaining.[6]

Romsey Abbey church, a few miles from Winchester, is a building of the same class as St. Cross, and displays an instructive mixture of the peculiarities and style of various successive periods. It is a cruciform building of considerable size, with a square tower at the intersection of the nave and transept,[7] and when viewed from the neighbouring hills, rises above the houses clustered around it, and forms the most important part of the town. It is curious to contrast, especially in a constructive point of view, the churches built by our forefathers and ourselves. Anciently every small village could boast a sound substantial church of stone, which in most cases has kept its promise of long endurance, and still serves to give stability and importance to localities which, but for this, had lost their identity long ago. At the present time little heed is given to the future; the immediate wants of the day are supplied for the most part by cheap and flimsy structures which cannot be expected to outlast the present generation.

[5] Bentham says, in his History of Ely Cathedral Church, 1771, when speaking of the origin of pointed arches, "Some have imagined they might possibly have taken their rise from those arcades we see in the early Norman or Saxon buildings on walls, where the wide semicircular arches cross and intersect each other, and form thereby, at their intersection, exactly a narrow and sharp-pointed arch. In the wall south of the choir at St. Cross is a facing of such wide round interlaced arches by way of ornament to a flat vacant space; only so much of it as lies between the legs of the two neighbouring arches, where they cross each other, is pierced through the fabric, and forms a little range of sharp-pointed windows: it is of King Stephen's time; whether they were originally pierced I cannot learn."

[6] According to Milner the church of St. Cross is 150 ft. long. The length of the transept is 120 ft. It is cruciform, has side ailes, and a large square tower at the intersection.

[7] "The length of this church, according to the curious description given in the addenda to Brown Willis's Mitred Abbies, is 240 ft., and its width, that is to say, the length of the transept, 120 ft.; his words are—'Ecclesia de Rumeseye, de fundatione regis Edgari, continet in longitudine circa 90 *steppys*, et parum ultra; item in latitudine continet circa 46 *steppys* meos.' The height of the tower is about 120 ft. and that of the body of the church is said to be 80 exactly."—*Spence's Descriptive Essay*, p. 37.

Romsey Abbey church was founded in the 10th century, but there does not seem to be reason to believe that the present building has any parts of that date. The most ancient portion of the church as it now stands, is probably the work of the same Henry de Blois who built St. Cross, in the middle of the 12th century. It is remarkable for having a small chapel with semi-circular absis, on the east side of each arm of the transept. The ailes of the choir likewise terminate in a semi-circular absis formed in the thickness of the wall, so as not to show externally. The choir, now used for divine service (which doubtless originally terminated in a similar absis) and the transept, are Norman: the greater part of the nave, excepting the walls, is of Early English. The west end contains a singularly lofty triple lancet window. According to those who maintain the necessity for symbolic design in churches, a triplet, which they consider to represent the Trinity, should be confined to the east end; to place it at the west end, they say, is a decided fault. We have here one instance, at all events, and by no means a single one, that this was not always recognised by our forefathers.

In the south wall of the nave next the transept, one of the original Norman doorways remains, and is now used as a window. It presents a series of concentric arches adorned with various sculptured enrichments, and supported by two columns on either side, with enriched capitals. In the external wall of the south transept, next the door, is a curious sculptured figure of Christ on the cross, about 5½ feet high, with a hand from the clouds above pointing to it. Near it is a small recess in the wall, probably to receive a lamp or taper. The present appearance of the east end of the choir internally is very picturesque, and may be advantageously studied. Some of the capitals in the ailes, at the east end, are sculptured with figures of singular appearance, and have led to three communications to the Society of Antiquaries, printed in the "Archæologia."[8]

The font is square, supported on five square pillars panelled. In minute points of interest this church is abundant. There are several interesting monuments and monumental slabs, some of which present curious examples of crosses and crooks. Unfortunately the names of the persons whom they were intended to commemorate, have, in too many instances, disappeared:

> "So perish monuments of mortal birth,
> So perish all in turn, save well-recorded worth."

Amongst the modern works, the last effort of Flaxman, a monument to the memory of Henry Viscount Palmerston and Mary his wife, should not escape notice. It is to be observed with much regret that this interesting building is, in many parts, in a very bad state of repair: and that unless some efforts be made to maintain it before decay proceed much further, but little of this structure will remain for succeeding generations.

In the foregoing brief remarks, the writer has had occasion to allude incidentally to symbolic architecture, and he cannot avoid availing himself of the opportunity which here offers itself to add one observation in connexion with it. He has been accused by some influential persons of having in "A Chapter on Church-building," (published in the *Civil Engineer & Architect's Journal* and afterwards reprinted in some of the daily journals) urged the super-eminent importance of symbolism, and the desirableness of the re-introduction of details, and arrangements fitted only for the Romish faith. Now if this were his opinion, he would feel no hesitation in respectfully maintaining it:

> "If I, my Lord, for my opinion bleed,
> Opinion shall be surgeon to my hurt,
> And keep me on the side where still I am:"

but it is not so. The little paper in question contained, it is true, a *resumé* of the opinions to that effect recently urged by some ecclesiological writers; but the motive of the paper was rather to utter a protest against their reception than to urge their adoption, as he ventures to think must be quite evident to those who have happened to read the whole of it. To quote one sentence from the paper in question: "We would most worthily adorn the house of God, to render it, to the extent of our means, fitting for its high purpose; but at the same time we would carefully avoid all proceedings, however agreeable to our temperament, however enticing to us as an artist, which should give undue importance to bricks and stones, and man's inventions and devices, which should increase the number of ceremonial observances, which should threaten to exalt the shadow in the place of the substance, and so lead to a state of things which did once result from such a course, and may result again, notwithstanding the increased amount of information possessed, and the general comparative enlightenment."

[8] From Dr. Latham, Vol. XIV, p. 136: from Sir H. C. Englefield, following the former; and from W. Latham, Esq., Vol. XV, p. 304.

BRITISH MUSEUM.

SIR—I have heard, upon what I consider tolerably good authority, the information coming to me at only one remove from the party himself, that a Mr. B., a gentleman in the University of Oxford, is getting up a design for the British Museum, in opposition to Smirke's; and intends to bring it before the Trustees in such manner that they cannot possibly avoid formally noticing it in some way or other. Yet, although I do not question the truth of this as far as mere *intention* goes, I doubt very much indeed if anything whatever comes of it.

With whatever ardour and alacrity they may be projected, enterprises of the kind are apt to break down very soon, and the mercury of zeal to sink very quickly from the boiling point to zero. Even well-wishers to it must consider such an attempt on the part of an individual, somewhat Quixotic; the greater probability, therefore, is that nothing more will ever be heard of it.

Although I agree with many others that the design actually adopted is almost the very last which ought to be so, I certainly cannot agree with your correspondent Dr. Fulton, who recommends the Egyptian style as a very suitable one for the occasion. To me it appears eminently the reverse, for that style is not only not a national but not even an adoptive one, nor at all naturalized among us in the slightest degree. I do not say it ought never to be employed by us, for any purpose, or under any circumstances, but I certainly am of opinion that to employ for a public and national structure what is not even an European style, would partake of absurdity, notwithstanding that the Museum contains a great number of Egyptian antiquities. Even a Gothic façade would quite as well agree with the interior of the edifice.

In regard to this last remark, it may be said that Sir R. Smirke's own façade will prove a better index to the interior, and prepare strangers better for the taste there displayed, than a design which, by rendering the exterior more imposing, would be a sort of architectural imposition, and lead people to expect a corresponding degree of architectural beauty within; nor is there any denying that such is in some degree the case. Still there are attractions of another kind within, and that they are reckoned all-sufficient is evident, for, with the exception of the Royal Library, no part of the interior makes any pretension to architectural effect or beauty. The staircases—where, if no where else, some display of the kind is apt to be looked for—are remarkable for nothing so much as their ugliness: they might be all very decent and tolerable in an hospital, but in a national museum they are abominable.

Some of your "contrumperies"—as Mrs. Malaprop would call them—have expressed a hope that Smirke would, on this important occasion, give us something at last truly noble, and a perfected design worthy to rank as a work of art. Yet, however well-meant, this is surely preposterous, for how is a man to give us all at once what all his other works—the occupations of a lifetime—prove him not to possess in the slightest degree—at any rate only in the lowest degree. You might as well hope to turn a brewer's drayhorse into a racer in his old age. These remarks are, I must own, not particularly courteous, but Sir Robert Smirke may consider himself very lucky, if he be not doomed to hear by and bye others far more galling—such as will cause him to curse the British Museum and the hour he became connected with it.

I remain, &c.,

J. W. R.

MR. EDITOR—I can't for the life of me make out why you and some others should be getting up such a precious rumpus 'bout the British Museum. We John Bulls want none of your outlandish Germany doings—none of your Glyposticks and Wal-fiddlesticks—none of your Polly-Stiles and Polly-Crome—in short, none of your arrant paganism—your *base*-reliefs and *frisky*-painting—all which I take to be exceedingly expensive; but merely something smartish as one may say, yet that will not make our pockets smart for it.

Now, to my mind, there is a capital model to go by, all ready cut out for us, and a real Museum it is too, into the bargain, though not such a big bouncing one as that in Great Russell Street. I mean the one in Lincoln's Inn Fields: now that I call a tasty, sensible sort of a thing—genteelish and quite tippy. What the inside may be I can't say, for there, as I'm told, they let in only the quality people, but it looks a snuggish, comfortable-like place enough.

As to the Big British, 'tis of no use for you or any other body to make a botheration 'bout it now, 'cause the *face-head*, as you call it, is begun, and getting on swimmingly, so you may as well all hold your tongues.

ONE OF THE MILLION.

THE PHILOSOPHY OF CORAL FORMATIONS, AND THEIR ARCHITECTS.

No. III.

The ocean is the mother of earth, the fruitful womb of production, the *living principle* embodied in forms defined, being the unceasing architect of substance. Generated from the elementary compounds of air and water, living creatures are produced, having peculiar generic character, the maintenance of form and quality depending upon climate and association, or, the more uncommon incident, accident of birth. With the change of climate and association, organic bodies undergo a change, genera dividing into orders, orders into species; thus the earth multiplies in all its parts, quantities, and qualities, by the action of the living principle manifest in living forms, and in the multitudinous changes continually taking place in the fossil and mineral kingdoms. From the sea weed to the sponge, from the sponge to the lime-secreting polyp, from the polyp to the molluscous animal, from the invisible animalculæ to the whale, from the fish to the insect, the bird, and the beast, from the plant to the animal, and from the minutest spark of life to man, the great chain of life is inseparable.

In the varying strata of the earth, man may see broadly and distinctly marked, epochs of creation—and epochs of destruction—a series of ages succeeding each other—of generations succeeding generations—of climates succeeding climates—of local and general changes and catastrophes. Every region of the waters opens to the inquirer new and beautiful truths of nature, attests to the forming powers of organic bodies, and speaks of changes to which all species and all individuals are necessarily subject. The coral formation, its varying composition and character, and the sequence of events or manifold changes accompanying it, is as plainly delineated in the chalk, oolitic, and limestone ranges traversing the surface of the earth, as it is in the waters of tropical seas: the one and the other tell the same truthful tale, of myriads upon myriads of bye-gone existences, of fossil animalculæ and animals, of species analogous to or identified with those now living within the waters, whose being and existence as fossil or mineral bodies assure us of long uninterrupted periods of repose, of sudden and violent catastrophes, and of causes necessary to effect the end proposed. In the coral rag of the British strata, in the lias and other formations, we find an association of species peculiar to warm tranquil seas, their aggregate masses tell of an uninterrupted succession of generations, their sudden extinction, of sudden catastrophes, produced by changes in the position of the earth's surface, and consequently cessation for a time of living action in those regions affected by the change: all distinctly define, by their composition, character, and association, the inviolable laws by which oceanic, lacustrine, and terrestrial life is governed in distribution and change.

Mr. Darwin, treating largely on this subject, observes, "from the limited depths at which reef polypifers can flourish, taking into consideration certain other circumstances, we are compelled to conclude that both in atolls and reefs, the foundation on which the formation was primarily attached, has subsided; and that during this downward movement, the reefs have grown upward." The conclusion he comes to is as weak as is the evidence from whence he has derived it.

Of the largest lakes disposed within coral groups, such as the Atoll Suadiva, which is 44 miles long and 34 broad, enclosing a great expanse of water from 250 to 300 feet deep, other and more extensive views may be taken of their mode of formation. We have not yet to learn that the bed of the ocean is full of inequalities, resembling in this respect terrestrial earth: its hill and mountain chains and groups are of great extent, and vary much in their general composition and character; it has its extensive plains and deep valleys, and its lands favourable or inimical to life: the mountain heights of the earth, represent the bases of the submarine mountains, the one and the other, in the absence of the requisite degree of heat, being incapable of producing or sustaining life, for even in tropical seas, there are regions in which neither plant nor animal can exist: the filling up of the lower depths must therefore depend upon the matters continually carried into them by currents, or which are precipitated from the waters above them. The lowest region where life is produced, is analogous to the boundary of vegetable existence on the Hymalayas or Cordilleras, sustaining species of the simplest organization, wholly devoid of lime and purely siliceous; the next region is productive of other species, and to this succeeds a region wherein animals secreting calx and other peculiar earths are present in more or less abundance. Mr. Darwin contends, in vain, that the polypifers do not build from greater depths than 200 feet; for although their growth is protracted, and the number of species curtailed within the lower regions, still we are assured that calyx secreting polypifers exist in beds at or near 2000 feet in depth, and it is these artificers that lay the foundations and pave the way for the madriporæ and milleporæ, shell fish, crustaceæ, &c. that complete the structure. On the bosom of submarine mountains the polypifers commence their work, and precluded from descending within deeper and consequently colder regions, they spread themselves upwards, right and left, as they are enabled to do from the nature of the soil on which they rest: if building on a clump of submarine hills, the valleys can only be filled up by other means, far slower than those of organic action, consequently, the structure rises as a great amphitheatre or encircling reef, having openings caused by openings at the foundations, by tidal action, and by local depositions of sand or marl. At other times numerous structures slowly arise independent of each other, or united as so many links in the great chain. The atoll formed, the openings admit the tides, which carry many substances into the lake, and by their rotary motion contribute to prevent the coral from growing within the encircling reef.

That the inequalities of the ocean bed as well as tidal action give form to the barrier, is demonstrated by the Great Chagos, which is about 90 nautical miles in length, and 1 in width; its banks consist principally of rock covered with sand, arranged so as to form a great basin, the central part consisting of a vast plain covered with marl intermingled with shells and marine relique; it slopes outwardly to unfathomable depths: now a circle to this extent cannot for a moment be imputed to volcanic causes, nor does it appear that it could have been formed otherwise than by being carried round the surface of a vast track of table land, elevated far above the lower plains of the deep. The phenomena of the African and Asiatic deserts give some idea of the mode of formation of atolls. We there find valleys varying in size, surrounded with amphitheatres of hills, the very counterpart of atolls now formed and forming in the Red Sea, the Indian Ocean, and the Pacific: chains of hills nearly 2000 feet in height and hundreds of miles in length, consisting almost wholly, (from the base to the summit,) of calcareous matter, beds of coral, of shell fish, &c., all united in the general mass, strata with strata. Many of these chains of hills are wholly calcareous, and consist of corals and other lime-secreting species; they are nearly uniform, rising 200 or 300 feet in height, above extensive plains of sand, gravel and marl, the amphitheatre having seldom more than 1 or 2 openings leading into the valley, which is generally level with and consists of the same materials as the plains; although there are often several openings ranged at different heights: the soil of the valleys is in fact at all times indentified with the soil of the plains now disposed within the Red Sea, being a greyish marl, (which Darwin very unphilosophically terms mud,) combining with vast quantities of shells and other marine exuviæ, and some of the valleys have been explored to the depth of more than 150 feet, without meeting with any other material. Again, we have islets and islands formed of peculiar species of shell fish and polypifers, clumps of tubiporæ, upwards of 30 feet high and of great width, solid masses of rock formed almost wholly of serpularia, hills of mummullites bounding the Nile, and vast mounds of sea-weed blended with salt and calcareous matter. If, therefore, the reef, the islet, and the atoll sink as they are built up, why have all these vast tracks been elevated? and why are the many thousand islets and reefs within the Red Sea continually nearing the surface and rising above it? Many of the mountains forming the African chain are also of vast height, and wholly of calcareous formation: none of them present a growth of one continuous family throughout the whole extent, but all demonstrate the vast depth of the calcareous or solid limestone formations: between these mountains and the sea the plains in many places embrace a vast area, and while the mountains show that their bases have formerly been washed by the sea, the plains demonstrate their organic origin and end in a fringing reef, which in some places is wholly removed from the action of the sea, in others, is still laved by the waters, and contains many singular grottos of dead coral, rising from 15 to 30 feet from the beach: the beach is of fine shell sand, and gradually shelves into the waters.

If, as Mr. Darwin would lead his reader to infer, the reef gradually sinks as it is built up, there is nothing to prevent its being uniform to the depth of many thousand feet, but the revealed reefs of chalk, limestone, and oolitformations of terrestrial earth tell a widely different tale, for even the most solid limestone rock is formed, not of one but, of numerous species, of numerous families, of countless individuals, and of the atomic particles of these countless myriads which have undergone decomposition, all of them possessing the same elements, and consequently in their union in the fossil and mineral kingdom, producing the one result, under its several forms of carbonate and sulphate of lime. Where the reef is built up by living polypiters, there the valleys and plains are built up also by broken coral, calcareous depositions and sands; but, unless aided by tidal contributions, the latter advance towards the surface far more rapidly than the former: aided by tidal action sandbanks form, filling the lower depths, capping submarine mountains, or forming mountains of themselves, as is the case most particularly in the Atlantic Ocean. It is to the vast deserts of the earth, virgin islands, and fossil formations, existing under every latitude, that Mr. Darwin has to look for an explanation of coral atolls, islets, islands, and barrier reefs; he says we cannot believe that the broad summits of mountains lie buried at the depth of a few fathoms, and he asks in his simplicity where we can find terrestrial mountain chains many hundred miles in length. A slight glance at the map of the world will answer the latter question, and the very child in navigation will inform him, that the irregularities of the ocean bed are analagous to those of terrestrial earth, that they form hill and mountain chains and clumps, and consequently valleys and extensive plains: there is no reason required why their summits do not appear above the waters, the sandbank and the hidden rock are quite sufficient proof that they are there. The fishers of the Mediterranean tell us that coral is found, even in those latitudes, growing at the depth of 900 feet; therefore, if heat necessary to its existence, propagation and increase, is here manifest, how much deeper have we a right to expect it in tropical seas. Were the great barrier reefs and atolls uniform in their growth and material, from their bases to the surface of the waters, and was this sinking strikingly manifest in all coral regions, then might we embrace Mr. Darwin's hypothesis; but when we find the whole earth we inhabit intersected and covered with like formations, we are naturally led to conclude that nature perfects her works without violence: he very candidly tells us that he cannot furnish, nor are we to expect proofs of continued subsidence, and so says Mr. Lyell, when he talks of elevatory forces in action.

The polypifers build in regions adapted to their nature; and bearing in mind that lime-secreting animals cannot exist without heat, if, perchance, they do without light, which I much question, we must conclude that Malte Brun is in error when he asserts that light only extends 270 feet in depth, and that heat extends but a little farther. The temperature of the ocean diminishes as we descend, much in the same manner as it decreases as we ascend elevated portions of the earth; and the same laws of nature which regulate the distribution, habits, and characters of species, are applicable to both. It matters little to the philosopher whether the coral reef, islet, or islands, or the vast amphitheatre existing within tropical seas (unwisely termed atolls) are built by one or by 1000 species of polypifers, we feel assured that they are built, that they rise unequally, that they continue to increase, that in composition and character, in form and disposition, they resemble the calcareous formations of the earth now far removed from the ocean, as is demonstrated by the vast regions of Africa and Asia; and that they are continually adding to the earth. Upon examination we find certain species of hardy madrepores rising to the level of the tide, and bidding the breakers defiance; that almost invariably they replace some species and give place to others; that at nearly the greatest depths sounded, some of these lime-secreting species are found; and that every region, beneath every latitude, has its peculiar vegetation, or peculiar animal species. The polypifers, checked in their growth by currents and depositions of sands, build laterally, towards the surface of the waters, to the right and to the left. In the shallows of the Red Sea there are numerous circular reefs formed exclusively by one particular reef species throwing their branches out on every side; in the valley between these reefs, formed by clusters of such reefs, we see a variety of species in solitary clumps, or intermingling with each other, and apparently struggling for existence; but however circular the reef may appear above the waters, this peculiar form soon ceases beneath, for on that side of it not affected by the currents, and in very quiet parts within the barrier or encircling reefs, the growth of the coral is nearly uniform, and the spaces between each group becoming rapidly filled with living coral, the crowning islets always preserve their tabular appearance: thus, when they have spread to a vast extent, they sometimes become partially or wholly destroyed by sudden involutions of sand thrown upon them by tempests, and the whole family is thereby destroyed. In general they dip with a gentle inclination into deeper waters, and sometimes they exhibit epochs of general destruction, whole fields having been suddenly destroyed, from which, in the course of time, fields of lesser extent again spring up, to be destroyed in turn: thus many of the vast atolls or islands dip by a succession of steps or ledges into the ocean depths: the barrier, encircling, and fringing reefs, always present one or more precipitous sides, varying from a few inches to some hundreds of feet in thickness.

Ehrenberg, whose authority appears to stand high with some people, has made many unwarrantable assertions regarding the phenomena of the Red Sea, of which, from his very slight acquaintance with it, he could know, and evidently does know, little or nothing. He states that the corals only coat other rocks in a layer from one to two feet in thickness, or at most to a fathom and a half; there are thousands of elevated islets in this sea, and vast tracks fringing its shores, prove the direct negative to this assertion. I have seen many families of tubiporæ standing above high water mark full 30 feet in height and many yards in diameter on every side, and there is every reason to believe that their bases, several fathoms beneath the waters, are of the like composition. He speaks of massive corals which he imagines to be of such vast antiquity that they might have been beheld by Pharoah—these are large clumps of meandrina, the growth of from 30 to 50 years; he tells us harbours fill up with sediment, sand, and shell, proving thereby that he had never visited the principal ports; I believe that his visits were confined to Massouah. It is true, in calculating the growth of coral, latitude, dip, and inclination, must be taken into account, and also the many destroying or retarding causes of increase of the calcareous mass, for like the grass of a meadow, the gelatinous or living portion is liable to be continually cropped by the coral and other fishes, which continually feed upon them. The experiment of Dr. Allen, of Forres, as related by Darwin, who, having 20 species of living coral of 10 lb. weight each, found that after seven months they had become immoveably fixed, and many feet in length, stretching in the direction of the parent reef, is a demonstrable proof of the rapid growth of many species of reef coral; again, the relation of Lieut. Welstead, in which he says, that a ship in the Persian Gulph had her copper bottom incrusted, in the course of 20 months, with a layer of coral two feet in thickness, which it required great force to remove; also, the incrustation of anchors and other substances exposed for a short time in deep waters, are further confirmation of the rapid growth of coral under favourable circumstances. Captain Moresby speaks of knolls, in the Maldiva amphitheatre, of not less than 100 yards in diameter, and 250 feet to 300 feet deep, and in the shallows of the Red Sea these knolls are beyond number, consisting of branching madreporæ of one particular family, growing up like one huge pillar, with branches radiating from every side, and festooning from the summit, knoll with knoll, until they fairly entwine with each other; the general structure has been formed by the successive growth and death of individuals, or from the base of the trunk and lower branches, madrepore or millepore having consolidated. It is not from the branches being accidentally broken off that the reefs receive increase, but principally, from the general struggle for existence of species with species; thus, if the red coral attain the height of three feet in 10 or 15 years, other species springing up immediately around its base, enclose it within their stony folds, and they, in turn, become buried beneath rising generations: thus the milleporæ in the Pacific encroach upon the porites and millepora complanata, and the latter upon the strongly branched madrepora. Matilda atoll, described by the crew of a wrecked whaling vessel as "a reef of rocks," was, when Captain Beechey visited it 34 years afterwards, a lagoon island fourteen miles in length, and having one of its sides covered with high trees; and although, from disturbing causes, some of the islets and islands of the Red Sea do not exhibit a sensible increase during a long interval of time, the native dwellers on the coasts relate many remarkable instances of addition to the main land, and to islands which they resort to for the purpose of fishing for pearl, and tortoise-shell.

As the tidal action gives the direction to the outside of the barrier, so does it very often, by being introduced therein, give form to the interior of the reef, the hollow or central basin, resulting from accident, being preserved from filling up by the tides, and by constant depositions, which prove fatal to the polypifers, and prevent their extending over the basin. It is well known that almost all the large lagoons communicate with the ocean by one or more openings, and by these passages the waters bring in quantities of sand and marl, which constitute in varying proportions the bottom of these lagoons; but if the encircling reef prevent the intrusion of these matters, the lagoon is soon filled up with living coral and shell fish. The larger atolls, as they are termed, are, more properly speaking, vast amphitheatres, sometimes formed of barrier coral, at other times of sand banks, calcareous matters, and dead coral or limestone rock; the interior being very rugged and unequal, numerous islets appearing above or beneath the surface, sometimes united at their base, forming groups and chains of hills, at other times running along the shores of the main land, as though marking out its future boundary in that quarter: the circular form of these reefs is a necessary consequence of their continued increase; for having fixed itself in the ocean bed without reference to the nature of the bed, the polypifers radiate on every side, as well as upwards, consequently, if no disturbing causes interfere, its assumption of the circular form is certain: such indeed is the mode of growth of astræ, meandrina, and other clump-like corals, the branchiform differing in giant growth alone: but there is no law commanding this form, for many clumps are square, oblong, or irregular: in fact, these stupendous edifices are produced by very feeble and minute creatures, of the lowest organization, powerless, and depending upon favourable circumstances of latitude, dip, and inclination, for their existence and propagation, and whether they extend laterally, or around the level surface of a submarine mountain, or from clumps of rock, or sand, depends upon the chance of circumstances more than upon design. Many of the lagoons open down into the valleys of the deep, others are formed from the multiplied depredations of coral fish, adapted by the thick scaly coats, to glide through the coral branches with impunity, like the more delicate corals living within the encircling reefs, feeding upon the latter, and thus retarding their growth, permitting only the more hardy and quicker growing madrepores to build up their peculiar edifices until they reach the surface of the waters.

Mr. Darwin speaks of the limited depth at which reef building polypifers can flourish, at the same time he quotes Captain Beechey, who informs us that off Keeling atoll all the soundings, even the deepest, were on coral, and what I have previously stated is quite sufficient to prove that according to the laws of light and heat, which regulate their existence, composition, and character, they must exist in much greater depths than in the Mediterranean, Ægean or Adriatic seas. Most of the atolls in the low Archipelago are of an elongated form; thus, Bow Island, which is 30 miles broad, is not more than 5 miles wide; numerous other islets and atolls bear the like proportions.

Admitting then, that in by far the greater number of cases an atoll consists of a simple elongated ring, we are still as far as ever from embracing the idea of these atolls being formed on the summits of volcanos, as is presumed by Mr. Lyell; that they cap submarine mountains is very evident, that vast numbers have one general base is equally evident, thus in Marshall group many atolls are united together by linear reefs; and in the shallows of the Red Sea most of them are thus united in groups or in a linear direction, the barrier reef polypifers being pre-eminently the architects of the atolls and the circular reefs, formed in entirely by the one particular family. Upon examining the early development of some of these encircling and barrier reefs, we find that the polypifer fixes itself almost indifferently to the level and to the slope, always affecting growth perpendicular to the plane of its position; this circumstance alone must have some influence on its extension: thus, for instance, if it take root on the side of the sand bank, it fixes that portion of the sand to which it is attached, and in growth takes the form of the upper portion of the bank, fringing it more or less all round: advancing thus, and radiating towards the surface of the waters, and outwards it continues to advance while, the interior or apex of the sandbank experiences in many instances little or no alteration, the tide passing through it by constant disturbance, preventing the polypifers from extending in that direction: that this is one cause of the hollow in the centre in the reef or island is proved by the nature of the material which forms the bottom of the basin, which is ocean marl, sand, or such matters as are cast by the waters upon the reef. On the other hand many of the islets and atolls covering vast areas spring up as table land, within an equal surface which have no lagoons, and other lagoons when open to the sea rapidly fill up with the living coral. Wherever soundings were obtained off Egmont Island and the neighbouring atolls, the bottom is found to be invariably sandy, and the currents run with great force around them; this alone is sufficient to account for the precipitous appearance of these formations, for, in the live or moving sands, it is impossible for the polypifers to extend their edifice over the area thus disturbed, and consequently their labours are confined to building upwards.

Again, there are other causes which tend to give form to the reef, thus the polypifers spread over the submarine plain, covering a large area; they build upwards and attain a considerable height, when a sudden evolution of sands or calcareous matters partially or wholly destroys them: if partially destroyed, the disturbing causes having ceased, they again spring forth in detached groups upon the parent bases, forming fields of lesser extent, and continue to advance towards the surface until a second catastrophe has the like effect: thus the building arises from vast depths by a succession of steps. Wherever sands can accumulate upon a bed of coral, then the polypifers are necessarily subject to partial or entire destruction. That the tidal currents have much influence in forming the reefs, is manifest by its form and growth; within tranquil waters the reefs have a gentle inclination from summit to base, the natural consequence of uninterrupted and expanding growth, and in a chain of reefs they may be often seen overhanging until their upper parts meet, vast caverns or arches are formed, which, if not filled up with deposits from the waters, may continue thus, age upon age; for no sooner is light and heat excluded than the polypifer ceases to perform its functions. It appears evident that the law of forces is the law of growth of coral, that the polypifer taking root within a quiet area, will enlarge its parts on every side until it fill that area, embracing in its rising structure all the inequalities of that plain: that if a tidal current bounds that plain at one or more of the cardinal points, and brings with it sands or other matters, and thus forms accumulating beds, such formations must prove natural barriers to the advance of the coral in these directions, so long as this action continues; the general steepness of the Chagos and Maldive atolls is produced by these causes: the uniform distribution of the reefs on the leeward side of the Mauritius and in the extensive shallows of the Red Sea, demonstrating that quietude is essential to their expansion. Again, that where the sands or ocean marl accumulate over a given space of a reef, then without consideration of the depth the polypifers cease to build, so long as the disturbance continues; it is indeed an admitted fact, that the greater part of the bottom of most lagoons is formed of sediment, varying in its nature, but having the one effect the destruction of the artificers of the reef.

Mr. Darwin says the islets placed to leeward are liable to be occasionally swept entirely away by gales, equalling hurricanes in violence, and therefore their absence is a comparatively unimportant fact: it is true that the action of the waves does often wash away so much of new islets as appears above the surface, but beyond this the most tempestuous seas can have no influence, consequently if islets did exist in this direction, as he would have it understood, they would still present themselves to the view as submerged reefs, but in reality the polypifers do not extend themselves in the disturbed line, or if they do, they are very small compared with those to windward. The circumstance of there being no living coral on some submerged reef, is anything but proof that those reefs were once elevated above the surface of the waters, but is rather demonstrative of the destroying effects of sands when thrown by occasional disturbances upon the living barriers, for wherever these depositions lie, there the polypifers cease to build, until new generations spring from the sandy base, having no relationship in many instances to those who have gone before them: however thin the coating of sand may be, a sufficient cause exists as in the case of the Great Chagos Bank, Speakers Bank and numerous others, for the appearance of dead rock in quantities more or less.

That tidal action as well as accidental disturbances has much to do with the form of reefs, is manifest in the numerous openings of reefs, and in their geographical distribution; the fringing reefs encircling the Mauritius have a straight passage open in front of every river and streamlet running into the ocean, and at Great Port there is a channel like that within the barrier reef extending parallel to the shore, each end being entered by a river, the two streams bending towards each other. The Australian barrier extending nearly 1000 miles, bending to the sinuosities of the coast, would appear to have its basis on a submarine mountain range on either side; its boundary of growth from the bottom appears to be defined by sands; it has few openings sufficiently large for vessels to pass through, and from its general dispositions it has the appearance of being one vast submarine mountain chain varying in its composition beneath but capped throughout with coral reefs the polypifers being unable to extend their breadth in consequence of tidal action and shifting sand, throughout this vast range there is no evidence of extensive dislocation such as might be expected had it been elevated by volcanic action, but its sinuosities and general character give it a striking similitude to many of the calcareous formations on the main land, all of which bear evidence of their elevation above the present sea: tidal action is also manifest in the fringing reefs of Eastern Africa, and in fact all other places where those formations abound.

The coral formation appearing above the waters is violently attacked by the element which gave it birth, and before the repeated attacks of tempests it falls piecemeal, and the upper portion being washed away, it once more becomes a sunken reef, and the polypifers may be once more observed busily building up the edifice: again, from the effects of currents, many islets are washed away as is recorded of the Maldives, and as I have repeatedly observed in the Red Sea: but this destruction is far from being general, for the increase of coral reefs, coral banks, and calcareous beds, in adding to the earth, is infinitely beyond the decrease occasioned by the destroying powers of flood or fire, and every island and every barrier reef standing above the waters, from its unbroken appearance, and the simplicity of its material demonstrates the vast increase the earth constantly receives principally from the labours of these minute forms of life.

Of the largest lakes disposed within coral groups, such as the Atoll Suadiva which is 44 miles in length, and 34 in breadth, and encloses a great expanse of water from 250 to 300 feet deep, other and more extensive views may be taken of their mode of formation such as the peculiar form of their submarine bases, the effects of the currents, and of depositions, and when above the surface, the effects of storms. It is observed as a peculiarity and exception to the general rule, that many of them have a greater number of openings on the leeward than on the windward side, thus on the near sides of Ari, and the two Nilandoo atolls which face S. Màle, Phaleedoo and Mologue Atolls, there are 73 deep water channels, and only 25 on their outer sides, this difference is attributable to the action taking place while the reef was far beneath the surface of the waters, the more numerous lodgments of sands, marls, &c., inimical to polypius life, being deposited on the extreme edge of the reef in the tidal line, which occasioned more numerous separations or openings on the less exposed side of the reef.

From whence then, are derived the vast quantities of calx requisite to supply the building of these enormous formations, constituting mountain groups and chains, and filling the ocean valleys and the valleys of all seas, with calcareous beds many hundred feet in thickness, and many thousand miles in area constituting also, so great a portion of the surface of terrestrial earth? Dr. Buckland says "It is difficult to account for the source of the enormous masses of carbonate of lime that compose nearly one eighth part of the superficial crust of the globe; but until it can be shown that these animals have the power of forming lime from the elements, we must suppose that they have been derived from the sea, either directly or through the medium of its plants;"—this is a very unphilosophical way of disposing of the question, for, admitting that it cannot be proved that the lime is elaborated within the living body, we can still demonstrate that it cannot be derived from springs or through the medium of plants: the quantity of lime held in suspension by the ocean waters is very trifling, and as nothing compared to the chlorides of sodium and magnesia—and to furnish these three earths in the quantities required, the whole interior of the globe would be insufficient: again, was it derived from springs, what an enormous supply would be required to fill up the bed of the Mediterranean alone, which, according to Donati, is 900 feet in thickness in calcareous matter: again, fuci are not to be found in the lowest depths; they follow animal species in the order of developement, and abound principally in those regions where coral formations are wholly unknown: they do not secrete lime, although in the shallows they sometimes become coated with this material by polypifers.

The small portion of lime held in suspension by the waters of different seas and, on the other hand, the vast quantity of chloride of sodium, increasing warm and tranquil seas. Where the coral reefs are most abundant, naturally gives rise to another question—whether, elaborated within the living system, the sodium is not converted into calcium; it is true that chemistry sheds no light upon the subject, the earths being classed as undecompounded bodies, widely apart in their nature from each other: but observation and experiment inform us that the earth undergoes many modifications, and, as instanced in metals, permanent changes: but, admitting a negative to this supposition, we have still to look for its elementary constituents in the living body. Mr. Lyell supposes that it is supplied by thermal springs, but if so, why are the lower regions wholly destitute of lime-secreting species? by warmth they are produced, and, deprived of the requisite degree of warmth, most of the species perish: again, the genera, orders and species multiply rapidly in the shallows, and the quantities of calcareous matter increase faster and more extensively there than in the deeper waters; numerous species of the more delicate coralines existing only where the reflecting and radiating heat is greatest: again, in the vast shallows, whose valleys are covered with sand or ocean marl, the increase of calcareous matter is still more rapid and extraordinary than within the ocean bed: the law of formation and secretion being palpably light and heat, under all circumstances, or, more properly speaking, galvanic action produced by the conjoint operations of light, heat, and life: again, that they do not derive their lime from the base on which they rest, is evidenced by the continuous increase of this calcareous base, as it derives accession of matter from the living and the dead: thus, the entire beds of inland seas are rapidly filling up, and by the filling up of the ocean, is uniform over vast regions.

To those who ask the question—"Whence comes calcium?"—I would say, —whence comes the perhaps, equally enormous quantities of animal oils—gelatine, albumen, and other compounds, manifest in organic forms, being in quantities constituent of the animal and vegetable frame-work, each of which in aggregate, would form mountains and probably mountain chains? Whence come the mineral oils and bitumens of Ava, Persia, America, and England? Whence, but from the chemical and mechanical operation of life; as is testified by the vast fossil formations of the earth, and by the changes that are continually taking place before our eyes. In the fossil we identify the once living body, its peculiar species, and, consequently, its peculiar habit and character; we observe that its calx is remodified in combination only, but its gelatine and albumen have become converted into silicious earth: again, the tree is converted into coal and the animal blending therewith is also converted into coal: again, the fossil is silicified as flint, in like manner as the madrepores and millipores consolidate and become converted into rock. The analytical chemist, to whom all men are indebted for many of the most important discoveries, explanatory of the nature and properties of bodies, and of their elementary constituents, tells you that, however numerous the phenomena of natural bodies, however complicated their organic or inorganic structure, however dense or subtle their material; all of them are resoluble into the four known compounds,—hydrogen, oxygen, nitrogen, and carbon; all of them are mechanical mixtures of these four Elements. Why, then, should it be made a matter of surprize, that the living principle, which is universally present and directs these numerous combinations, should be the primary cause of elaborating calcium within the living system. Animals of even the lowest organization, elaborate ammonia, which is the distinguishing characteristic of animal life; animals elaborate albumen, gelatine, and carbon; and vegetables absorb the latter, giving it form and consolidation, and transmitting it in this state to the fossil and mineral kingdom, the one and the other of the undecompounded bodies are mechanical mixtures in mathematical exactitude of primary elements, or of these united with secondary qualities. Admitted that many terrestrial animals abstract the portion of lime they contain from the earth, still this is manifest proof that such is the general law of nature; the complex organization of the higher orders of animals is produced by abstraction of some compounds from other bodies, and by the elaboration of others, by the mechanical and chemical union of these abstracted compounds within the living system: thus bile, red blood, fibrin, and other familiar products are generated.

Proposed Docks on the Cheshire Side of the Mersey.—The leading topic of conversation in Liverpool has been the avowed project of the commissioners of Birkenhead to construct a dock on the Cheshire side of the Mersey. It seems that the intention is not a new one, but has been cherished a considerable time, and the parties only waited until the corporation of Liverpool had disposed of their land there, or a portion of it, for other purposes, previous to announcing it to the world. The consent of the Admiralty has been obtained for enclosing the whole of Wallasey Pool, from the bottom of the Woodside Ferry to Seacombe—an area of not less than 340 acres. It was intended to have gates, a tidal basin of 30 acres, 12 feet of water at all times of tide, for vessels to float in, and dock space to the extent of 120 acres also an additional tunnel under the township, to connect the tunnel extending from the station of the Birkenhead and Chester Railway, at Grange-lane, to the Monk's Ferry, with the dock. The cost of the work was estimated at near 300,000*l.* All the pecuniary advantages derived from the dock are to be appropriated to the measure itself, and if ever, from the sale of part of the land, or otherwise, any other revenue should arise, it is to go in the reduction, first of all of the dock rates, and afterwards of the cost of construction, until finally the dock should be open to the whole world free of charge. Plans had been prepared, sections taken, bearings made, levels obtained, notices ready, and everything in a state of forwardness.

Westminster-bridge.—Since the carriage-way of this bridge was closed, the workmen have been engaged in removing the great body of loose sand and rubble walls which loaded the east pier of the centre arch unnecessarily, and are preparing to substitute brick arches, &c., for this, as described in Mr. Walker's letter to us, and as was done to the sunken pier on the Middlesex side. Mr. Nixon, the superintendent of the works, informs us that the lessening of the weight upon each pier by this operation, and by the proposed lowering of the roadway, will not be less than 1,700 tons, and that since this lightening began there has not been the smallest movement in any part; whether, however, this will continue so, time only can prove. Messrs. Walker and Burges have thought it prudent to take the opinion of two other eminent engineers, Messrs. Cubitt and Rendel: we understand their opinion also to be, that the sinking of the piers of the bridge is caused by the great load upon the clay foundation, their being no piles under this bridge, and the ground on the Surrey side being of a loose nature. Supposing this to be correct, to lessen the load appears the direct remedy. The masonry of three of the arches being laid bare gives an opportunity for taking out any suken stones, and stopping the cracks from the upper side, and is now in progress. Many of our readers may not be aware, that when Westminster-bridge was begun, the intention was to have wooden arches, and that the thickness of the piers was enlarged for carrying stone arches without adding to the foundation. Hence perhaps their general weakness. It appears from the plans, which we have seen, that there is a thickness varying from 2 feet to 7 feet, of sand and gravel between the bottom of the caissons and the clay.—*Times.*

THE NEW AMERICAN STEAMER "PRINCETON," AND THE "GREAT WESTERN."

It appears that Brother Jonathan is in ecstacies, because he has produced a rival vessel to the Great Western, and beaten her in a trial, when the latter vessel was leaving New York at her last trip to England. The only information we can collect is from the newspapers, the first announcement appearing in the *Times*:—

A trial of speed between the Great Western and the American steamer of war Princeton is very minutely described in the United States papers. The result was a decided victory by the Princeton, though it is said the Great Western sailed faster than on any former occasion. The Americans, as might be supposed, have not lost so excellent an opportunity of displaying their talent for boasting, and speak of the victory in much the same terms as would have been used if they had conquered an important province. This eulogy of Captain Stockton of the Princeton, and under whose immediate direction the ship and machinery were constructed, appears in the official paper, the *Madisonian.*

Our friends across the Atlantic have forgetten to tell us that it was a "Britisher" who designed her engines and the propeller, both being the invention of Captain Ericsson formerly connected with the respectable firm of Messrs. Braithwaite and Co. of London, and patented by him in this country; the engines are of the vibratory principle (not oscillating). The following particulars we extract from a Liverpool paper:—

The Princeton is propelled by the Ericsson propeller—her tonnage is about 680, and the engines equal to the power of 250 horses; the diameter of the single propeller, which works amidships, 14 feet. The rudder is hung on a metal rudder-post, resting to a prolongation of the keel under and beyond the propeller, and, of course, beyond the hull of the vessel. Above the propeller, the cabin, of light basket-work, projects, and through it the rudder comes up. The Great Western is double the tonnage of the Princeton, and her engines are equal to the power of 420 horses. She draws four feet less water than the Princeton, arising probably from the great diameter of the propeller, and the necessity of its being submerged. The propeller makes 36 revolutions in the minute: the Great Western's wheels at the utmost 16.

From this comparison, it appears that the Great Western ought (?) to have had the best of the race; but Capt. Hosken has affirmed, in extenuation, that his ship was "deep," and that it was "rather more so than usual;" and he further alleges that, during the time the Princeton was sailing with the Great Western, the latter was going at the rate of "9½ knots" an hour, conveying apparently an idea that she was not going at her usual speed, whereas we have the testimony of F. B. Ogden, Esq., of this town (Liverpool), an authority of indisputable veracity, (who was present on board one of the vessels at the time, and saw and noted everything specifically) that "the distance from where the chase began, to Sandyhook, is perfectly well known, and capable of being ascertained by any one," and that "by the course the Great Western took the distance was 18 miles, while that taken by the Princeton was 21, the former performing the 18 miles in 1 h. 28m. and the latter the 21 miles, in 1 h. 31m. against a strong flood tide and adverse currents." This, therefore, would give the Great Western twelve miles an hour, and the Princeton fourteen, the difference being two miles an hour, instead of three quarters of a mile.

CONDUCT OF EUROPEAN NATIONS TO THEIR MEN OF SCIENCE.

Project for an European Temple of Science.

Shortly before the present Prime Minister of England assumed the reins of Government, he delivered an address at Tamworth, highly eulogistic of the various "Mechanic" and other Institutions for improving the working classes. That address excited much attention at the time it was published, and on the exaltation of its author to power, it was naturally expected that the opinions of the Premier would take some practical shape. Such, however, has not yet been the case. Nevertheless, when it is considered what vast commercial and other measures have occupied the attention of Government,—what difficulties Sir Robert Peel has had to grapple with in China, in India, in Scotland, in Ireland, & in Wales,—what a variety of complicated and conflicting interests he has had to encounter, or to conciliate, it will argue no want of zeal in the cause of science and public improvement because he has not hitherto taken up the subject. Moreover, it is but seldom that governments do take up matters that are not forced upon their notice from without. Men of science must begin the work themselves, which if they do with energy and unanimity, we are persuaded they will have no unwilling listener in Sir Robert Peel.

The Premier has expressed in terms his delight with, and his desire to support, Institutions for the promulgation of Science. Let it be our task to point out to this great statesman and to the world, what it is that would most benefit science, what it is that science most requires—what it is that would foster and furnish an impetus to the progress of valuable invention and popular improvement, beyond anything ever yet established or proposed. In a word, let us put Sir Robert Peel in the best practical way of carrying out his own professed opinions.

The late Mr. Rothschild called England "The workshop of the World." Now to the extent that England has deserved this compliment she has been mainly indebted to her coal, her iron, her capital the industry of her workmen, and most of all to the *inventions* and *improvements of our men of science*. Without such men as Arkwright, James Watt, Richard Trevithick, Henry Bell, Dr. Cartwright, Charles Tenant, and a few others what would her manufactures or her commerce have been? The first multiplied to an immeasurable extent the products of the cotton factory; the second formed that grandest of all modern discoveries, the improvement of the steam engine; the third (his apprentice) successfully applied the great motive power of steam to navigation. Without these three men and their inventions, without the Steam Engine, without the spinning jenny, without the steam ship, where would have been our superiority in manufactures, in commerce, or navigation? To those three men we owe more of our national wealth, and our national renown, than to all other men and all other circumstances that shine in the pages of our history. Yet how was one of those three men rewarded, and what inducement is there for others to "go and do likewise?"

Henry Bell was declared in the report of a select committee of the House of Commons appointed to take evidence upon steam navigation to have been the first successfully to apply steam to navigation. He had conquered vast obstacles by vast perseverance. He proposed his plan of applying steam to navigation upon a large scale to the Lords of the Admiralty. It was with great difficulty their Lordships could be induced to listen to the proposition, and when they did so, they laughed at it. With the exception of a Scotch member of the board, who from a kindred nationality took a slight interest in the success of his countryman, there was an unanimous feeling that steam could not be applied successfully to navigation. The author of the project, nothing daunted, thought otherwise and went on upon his own resources. After a long ordeal, and a great expenditure of time and money, the "Comet" was built and sent through the Clyde to the "lochs," and the mountains of the highlands. The simple inhabitants were amazed, but not so men of science and capital. Henry Bell had not taken out a patent. He had discovered and invented, but he had no exclusive right to the discovery and invention. What was the result? Companies were formed to adopt and carry out his invention. Those companies had capital which he had not. They competed with his boat and defeated it, simply by making their boats more elegant and convenient, and what cared the traveller for the claims of the first inventor? Henry Bell had built carriages in which others already began to ride.

While the struggle was going on, Henry Bell, in his ardour for improvement, occasioned a boiler to burst, which made him a cripple for life. Nevertheless, he invented a plan for deepening the Clyde, and the magistrates of Glasgow awarded him £50 per annum for life, for the valuable impovement to the navigation of their city. Fifty pounds per annum, however, did little for a man who dedicated year by year a much larger amount to the promotion of his grand plan of steam navigation. He saw it succeed, but from it derived no benefit. At 68 years of age he found himself occupying the Heleashey Baths, involved in debt, with a prison or a workhouse in prospect. Yes, he, the conqueror of the winds and the tides, the creator of the wealth of millions, the greatest benefactor to commerce that ever lived in this kingdom—he, aged, crippled, and destitute, applied to the British Government for relief, and his memorial was signed by 45 members of Parliament, provosts, and chief magistrates of maratime districts. The late Right Honorable George Canning was then the Prime Minister, but that distinguished statesmen had not made a Tamworth speech in favour of science. Henry Bell danced attendance upon him for three months; he occupied apartments at No. 22, Downing Street. Poor man, his hopes were fed but to be blasted—he was ultimately told that he was too imfirm for a country Post Office, and that he could not be placed on the Scotch Pension list, seeing, no doubt, that his services were not of that "parliamentary" nature which were generally so rewarded. He went home and died of a broken heart!

Another striking case is that of *Richard Trevithick*—a man of transcendant talents, gorgeous conceptions, and gigantic energies. Originally a miner in Cornwall, he invented, or was the first to carry into practical operation, the high pressure engine, was exalted to the rank of a Marquis and Grandee of Spain—almost worshipped as a demigod in the Indies; his inventions "annihilating space in the old world, controlling the current of the great Mississippi, and displaying the mountain riches of the Cordilleras* in the new, he returned to his own country to find support and found none—to seek for sympathy where there was nothing but apathy—possessed of princely property which he could not make available; his countrymen wondering and admiring, but none aiding or assisting—and returning many thousands of miles, "far away from children, wife, and sacred home," to perish poor, unfriended, comparatively unknown!

Now had an European Temple for Science, existed, could it be believed that such men as Richard Trevithick and Henry Bell would have been permitted to pine and linger out their latter days in helpless indigence? Is it right?—is it wise?—is it politic, that the great creators of national wealth should be so treated? All the common and ordinary trades and avocations of life have their asylums and institutions—why not science? Those who till lately were deemed "vagabonds" by the law, the actors of our theatres, have, nevertheless, "funds" patronized by princes and supported by *millionaires*—none for science! The very chimney-sweepers are not allowed to be swept from the earth by the besom of destruction, without a society to aid and protect—none for science, *Sir Robert Peel*—"None for Science!"

Well, indeed, has it been said by a great poet:—

"In the land of the North there are insects that prey
On the brain of the elk till its very last sigh;
Oh Genius, thy patrons, more cruel than they,
First feed on thy brains and then leave thee to die!"

φ

* See Civil Engineer, vol. 11, page 93, for a lengthened and interesting memoir of Trevithick.

(To be continued.)

Bridge of Notre Dame, Paris.—At the Academie des Sciences a communication was read from M. Fourneyron explaining the application of floodgates to one of the bridges of Paris. A committee of the municipal council of Paris, of which M. Arago was president, was formed some time since for discussing the practicability of closing the arches of the Pont Neuf, or the bridge of Notre Dame, with gates, by which the current of the river could be regulated at will, and which, by raising the level at a certain part, would give a fall of sufficient force to work powerful turbines for the supply of water to all parts of Paris. In 1841 M. Fourneyron submitted a plan of gates of such construction that they could be worked with ease by one man; but as it was impossible to pronounce fairly on the merits of his invention without absolute experiments, the Academy and the committee of the city of Paris resolved to suspend the expression of opinion until experiments could be tried. M. Fourneyron now announces that for more than two months past one of his gates has been in use at Gisors, and that it has proved successful.

NENE ESTUARY EMBANKMENT.

This undertaking was designed for enclosing from the sea a tract of most valuable land, about 4,000 acres, which will, when enclosed, be principally the property of the Commissioners of the Nene Outfall, under whose auspices the works are being carried into effect, and in which they are assisted by the professional services of that eminent engineer, Sir John Rennie. The embankment is nearly three miles and a half in length, and for some distance averages 28 feet in height, and at some parts of the line of works there is a depth at high tide of 14 feet. About one mile and three quarters, or one-half the whole length, is already completed, and from this portion of the work, as a specimen, it is allowed by experienced persons that it will be one of the best examples of a sea-wall to be found in England. The land, it is estimated, will vary in value from 50*l.* to 80*l.* per acre, and as a maiden soil, would be a fine site for a model farm of one of the agricultural societies of England. The works are rapidly progressing under the superintendence of Mr. H. H. Fulton, resident engineer, and the contract, we understand, was taken in August, 1842, by Mr. H. Sharp, for 60,000*l.* The Nene Outfall Commission, composed as it is of some of the most public spirited men of the day, headed by Mr. Tycho Wing, as chairman, has already effected great improvement in the condition of part of the fens of Cambridgeshire and Lincolnshire, by procuring a natural drainage for the lands in lieu of the inefficient and expensive system of drainage by windmills and other mechanical means, at the same time improving the navigation of the river Nene from the sea to Wisbech, to such an extent that formerly Humber keels of 70 or 80 tons could with difficulty reach that port, whereas now vessels of 400 or 500 tons can, without the assistance of a pilot, owing to the straightness of the channel, get up to Wisbech without the slightest difficulty. This navigation, as an artificial tidal channel, is said to be the finest of that description in the country. It was designed and executed under the direction of the late Mr. Thomas Telford and the present Sir John Rennie, and so important has been the result of these works that the trade of the port of Wisbech has been trebled during the last ten years. In the course of last year it amounted to 140,000 tons of shipping, though the shipping trade was in a worse state in 1842, than it has been in for many years past.

CONCRETE FOR WALLS.

Sir—I have lately observed in your *Journal* several communications from correspondents on the subject of Concrete for Walls. They all refer to what has been done in France, as specimens of that kind of building, without, I presume, being aware that our own country can afford many examples of buildings, the walls of which are of a very similar construction. Most of the roads in Dorsetshire are formed of chalk and flints—the scrapings of these roads the people collect, leave in a heap to dry, and when about to use it, they temper it with water. Their walls are formed in a wooden frame, forming about a foot in height at a time, rather thicker in proportion than would be necessary for a brick wall. I entered several farm-houses, the walls of which were entirely composed of this material, and seemed to stand well. Perhaps amongst your numerous correspondents there may be some found able and willing to afford you full particulars relative to the method employed, cost, &c., that is if you should consider the subject of sufficient interest for your *Journal*.

I am, Sir,
Yours very truly,
T. Withy.

35, *New Street,*
Nov. 10, 1843.

ON STOVES.

Sir—A letter appeared in your last *Journal*, on warming and ventilation, signed W. G., evidently written by one understanding the subject. The pith of his long letter is contained in his four last lines, where he says:—"It is evident that an ordinary fire fulfils all the principal objects of warming and ventilation, better than any of the unnatural modes which science, ingenuity, necessity, or desire of novelty, has yet given birth to."

As a stove manufacturer, I have watched the various fallacious modes of warming houses without entering into the use of them, the result of my observation goes to confirm the four lines quoted. The first introduced was by Dr. Arnott, to suit every description of room; for certain places, and with proper care and attention, this is the best of all the new stoves, but for use in a room inhabited by human beings, nothing can be worse. Ill health and disease attend them; these remarks are not made through prejudice, as I have had one in use 5 years, and find it superior to any other stoves, most economical in expense, and no trouble to attend; but it is put in a warehouse, with an abundant supply of fresh air. The various stoves, Vesta, Chunk, &c., or by whatever name they are palmed on the public, are all founded on the Arnott Stove, and are non ventilators, as are all modes of warming by hot air or hot water.

It is now only requisite to obtain the support of a Doctor of something, (music would do) or the certificate of a Chemist, so worded as to say nothing, and the more noxious the vapour, the more anxious are the public to inhale it; it was stated, in 1840, that an open fire stove, with appendages, was to be placed in the British Museum, to show future generations the mode of warming made use of by the English in the present age. Will all the fallacies of the years 1838 to 1843, be deposited there? They would not do much credit to the common sense of John Bull. Excuse these remarks, they are from your constant reader, and one who combines

Ventilation with Warming.

Sir—Many of the fires that took place in and about London last winter, and a few this winter, have been attributed to the defective mode of fixing the warm air stove, or whatever apparatus the house may be warmed with; this is a stigma on the stovemakers of London, which in justice to them should be removed; the fact is simply this, the most important part of a stovemaker's business, is entrusted to persons totally unacquainted with it. A gentleman wants his hall warmed, a tradesman his shop, or a churchwarden the church; he does not ascertain who will do it most effectually or economically, as regards consumption of fuel, or which man best understands his business, but who will do it cheapest. He therefore purchases the thing most puffed by the quacks, and sets a bricklayer to put it in its place. He is ignorant alike of the maker's intentions, and how to fix it; the next week the place is burnt to the ground, it is laid to the stove, the man who sold it lays it to the bricklayer, so no one bears the blame, it falls where it should fall, on the purchaser. I was once called into a case of the kind, where a hot air stove was fixed in a drying room, heated to a very great degree, and standing on a wood floor; the regret was not that the house was burnt down, but that it fell on the Fire Office to make good the loss; about eight years since, I was applied to for a design and estimate for warming a church in the city, I gave both, but they were returned to me as much too high; the parties purchased two things, I believe, called Scott's, (or some such name,) after using them five or six years, they paid me my price for fixing a stove in the church—sent their two things to the furnace, and now find they have more warmth at a third or fourth the consumption of fuel, so much for cheapness; let the parties who wish their houses warmed, employ efficient persons only to do it, and we shall hear but of few houses being burnt down by flues being overheated.

Yours truly,
A. Smith.

PRIORY CHURCH OF St. BARTHOLOMEW, SMITHFIELD.

Sir—From the circumstance of an interesting article appearing in your last number, on the parish church of Saint Bartholomew the Great, West Smithfield, I take the opportunity of directing further attention to that interesting structure.

The writer of the article referred to, suggests various Restorations which every architect must rejoice to see carried into effect; but it is chimerical to suppose that the expense which would have to be incurred thereby, could be defrayed by the parishioners. The funds *absolutely* required from time to time, for maintaining the fabric in a state of ordinary repair, are raised with considerable difficulty; and the few restorations which *have* been made, consisting of partially re-opening the Triforium, and Prior Bolton's window, were accomplished by means of a private subscription. To restore the choir to its former extent and in its original style, would, I consider, require an outlay of nearly two thousand pounds, to say nothing of the expense attendant on the alterations which such a restoration would necessarily involve, viz., the removal of the parochial schools, which are placed over the north aisle, and of an erection (used as a manufactory) situate over the east aisle.

Under these peculiar circumstances, it is uselsss to hope that any important steps towards a perfect restoration can be taken, unless a general interest in the subject be first excited; and although it would undoubtedly be a great boon co ferred on Art, were this valnable relic of Anglo Norman Architecture restored to its primitive grandeur, I fear it is by the public only, that so desirable an object can be carried into effect.

Yours obediently,
John Blyth.

113, *Aldersgate Street, City, November*, 1343.

THE WIER ACROSS THE SHANNON.

SIR—If your correspondent who furnished the article on the great Weir across the Shannon, in the October number of your *Journal*, would favour the public with a few more particulars of that work, I think it would be highly interesting to your readers, especially as he appears to make an assertion which in its present form I cannot admit to be true, viz., "that a bar or weir may be constructed across a river in such a manner as to give an increased discharge." At the same time I am aware that the channel of a river may be widened or deepened, so that, notwithstanding the impediment of a weir (of certain dimensions) an increased discharge may be obtained.

Supposing the Shannon at Killaloe to be in its former condition and flooded to the level of nine feet above the present level of the weir, I apprehend your correspondent does not mean to say that simply placing the impediment of a weir in a certain position would at once reduce the level of the water six feet. Under such circumstances there would not be any perpendicular fall over the weir, merely a slight rapid, the stream preserving its former direction, which being the case, the cross section must be taken in all places at right angles to the stream, to give the true sectional area of the river, which area would of course be reduced by the weir. If the weir were placed at right angles with the stream, and the river widened till the sectional area of the water passing over the weir was equal to the area of the river above, or if the weir were placed, as shown in the plan accompanying the communication, and the channel below deepened, so as to give a perpendicular fall over the weir, (in which case the area of discharge must be taken in the line of the weir,) then the advantages mentioned by your correspondent would be obtained: but unless the channel is widened, or deepened so as to give a perpendicular fall over the weir, the discharge must be impeded by any obstruction opposed to the stream.

I remain, Sir, &c.,

H. C.

ON CONTOURING OF MAPS.

SIR—In your Journal for this month I have read a description by Dr. Livesay of an instrument invented by him in 1839, for copying medals, &c. and in which he speaks of my "important application" of the principle of contouring, which he thinks may be subsequent to his invention. I only trespass on your pages to say, that if Dr. Livesay attributes to me the application of contours to the representation of ground, he gives me a very undue merit. They have been so applied for more than half a century, especially to military plans, where the relative command of ground is of great importance; for which purpose all officers of engineers are instructed in contouring. In France and Bavaria, and I believe in some of the States of America, they are used in the national surveys. In Ireland, Mr. Bald, the eminent civil engineer, contoured a part of his Map of Mayo. The application of accurate contouring to the representation of ground on the Ordnance survey of Ireland, commenced in 1838, under the direction of Lieut. Bennet, R.E., and the trials have proved that the system may be applied without incurring any such addition of cost as should preclude its general adoption, to which this question of expense had long been the only objection. There are many valuable papers on contouring in the *Mêmorial du Depôt de la Guerre;* and a concise chapter on the subject in Williams' Practical Geodesy.

I have only to add that I had not heard of Dr. Livesay's instrument till I read the account in your Journal for the present month.

I am, Sir,
Your obedient servant,
T. A. LARCOM, Capt. R. Engineers.

Dublin,
November 20, 1843.

REMARKS ON SHIP'S FASTENINGS AND STEAM BOATS.

BY J. S. ENYS, ESQ.

The necessity of great strength in the hulls of steam boats, has long been acknowledged, in consequence of the concentrated weight of the engine and boilers. In recent instances, however, a portion of this weight has been removed by the introduction of wrought iron framing in lieu of cast iron; more especially in large direct action engines. This objection to cast iron framings increases with the size of the engine, since a framing formed of this material, is liable to break when subjected to a variety of cross strains, at the junction of different masses of cast iron, at which points unequal contraction in cooling is apt to produce weakness.

Engineers have been accustomed to guard against injury from the weakness of the ship, by placing the engine on the floors in a framing, as independent as possible of the hull of the vessel, and left the ship-builders to provide a remedy against the sagging, or sinking of the centre part of the hull.

Though much has been done to strengthen steamers, yet enough remains undone, to render it a legitimate object of inquiry, whether the limit of strength has been reached in ship-building, while the severe and rapidly increasing competition of iron vessels, renders it of importance to the builders of timber ships, to consider every practicable means of improvement and reduction of cost. Conceiving the iron strap used by miners in connecting together the main rods in shafts, and common in all framing designed by engineers, stronger than the ship-builder's knee fastening, a frame was submitted to the society for the midship section of a steamer, in which a strap wes used for the purpose of connecting the deck beams to the side; this strap passes round one or more timbers, and is then bolted to the deck beams.

A similar method was shown for strapping an internal series of timbers to the floor heads and deck beams (forming two internal sides at the position of the bunkers). The arrangement of the coal boxes of large steamers on each side of the engine and boilers, would facilitate the adoption of a plan of this nature, without the loss of space exceeding one foot in the internal breadth of the vessel. The plan of four sides in this portion of the vessel, could be adopted in iron vessels with the greatest ease, in consequence of the facility with which the fastenings could be effected.

As regards the strength of the strap, it may be remarked that the straps connecting together the main rod employed in pumping water from deep shafts in the Cornish mines, have been known to bear the sudden repetition, for thirty million times, of a steam strain exceeding eighty tons (six strokes per minute average during ten years.)

The difficulty of effecting repairs will be made an objection to the employment of the iron strap in shipbuilding. Important as such secondary objections are, yet they are too often brought forward as the prominent features, in opinions that are given against the success of proposed alterations in shipbuilding. Time would alone prove whether the less tendency to require repair, where the iron strap is used, would equalize their average cost in repairs.—*Report of the Cornwall Polytechnic Institution.*

REMARKS ON FLOATING LIGHT VESSELS.

BY J. S. ENYS, ESQ.

The comfort of the light keepers on board floating light vessels will be increased, I apprehend, by the same means that would tend to produce greater safety in the vessel itself. It has been proposed to employ a larger vessel constructed of iron, to enable it to ride more easily at anchor—and such would be the result, if the same breadth was allowed, from the lessened draught of water. The form in which I am disposed to consider the subject is the relative proportion of the depth and breadth (outside measure), for the sake of comparison, of iron and the common system of timber vessels, and that of three series of planks fastening together. Taking the least possible depth at $7\frac{1}{2}$ or 8 feet, the breadth should not be less than 18 or 20 feet, and at 3·3 to 4 times the breadth for the length, from 60 to 80 feet long. The form of the midship department should be similar to that of a water fowl or of a light Dutchman. The former, however, does not ride at anchor as the latter does in bad weather, and we should look for the conditions of safety to some modification of these forms.

The floating light vessels I have seen, resemble the Dutchman only in their heavy appearance, and seem constructed to resist as an oak, rather than to bend as a willow. It is essential, I conceive, that a vessel suited for this purpose, should possess a large proportional surface department; in other words, that a light vessel should be lightly loaded. To enable her to rise with greater facility to the sea, she might be anchored by the keel by iron straps, passing round it and one or more of the deck beams. If the double plan was used, by changing the length of the chains more or less ease could be given to the bow in rising over waves. Perhaps a keel deepening aft would prove advantageous in some positions, though perhaps objectionable in cross tides and seas, and sharp bows might be used under some conditions. The species of knowledge required for mooring small craft in rough water, is seldom acquired by parties accustomed to large ships in the Atlantic or other open seas, and an apprenticeship on board a Dutchman, or experiments on board a trial vessel with tanks, by means of which a variable displacement could be obtained, seems to offer the best means of procuring the data required for a complete solution of the question, of the best form for a floating light vessel.—*Ibid.*

ON THE MEANS OF PREVENTING THE APPEARANCE OF SALTPETRE ON WALLS.

Communication from C. H. Smith, Esq., *in reply to Questions proposed to him by the Commissioners on the Fine Arts, respecting Causes of and Means of Preventing appearance of Saltpetre on Surface of Walls.*

The mineral substances chiefly used in building, consist of lime, sand, and different kinds of stone, neither of which contain any saline or deliquescent matter as an integral part of their composition. No trace of salt or alkali is mentioned in the analyses of various stones that were examined with reference to the selection for building the New Houses of Parliament. Bricks are made of clay, which consists principally of alumina and silica, but generally containing some portion of lime, in the state of carbonate or sulphate: carbonate of magnesia; iron in the state of oxide, or combined with sulphur; and common culinary salt: these various materials, when exposed to a red heat, act chemically on each other; the magnesia most probably will combine with the sulphuric acid, which it obtains partly from the iron pyrites mixed with the clay, and partly from the fuel, if coal is used. It is this sulphate of magnesia (common Epsom salt) which is occasionally found to cover the surface of newly built walls with an efflorescence like hoar frost.

The presence of saline or deliquescent matter on the surface of a building, either internally or externally, may, to a certain extent, be attributed to carelessness, ignorance, or inattention of those who superintend the construction of an edifice. Salts, alkalies, or acids, according to the usual acceptation of such terms, do not necessarily form any part whatever of building materials. Nearly all animal and vegetable substances, when in a state of putrefaction or decay, produce a certain quantity of saline or alkaline matter, which absorbs moisture rapidly; therefore every precaution should be taken to avoid admitting such substances into a building where damp walls are likely to be of serious importance. It has long been a practice among builders to "parget" all the flues in a building: for this purpose cartloads of excrement, frequently of many kinds, are procured from a cow-shed, and mixed with a little mortar, to put a coating throughout the interior of the chimneys. Another objectionable practice is common during the time that the carcase of a building is progressing, and partially until the "finishing" is nearly completed, which is that of allowing workmen to urinate indiscriminately against the angles and recesses of the interior of a new building: no part is more frequently selected than the fire-places before the stoves are placed therein; and in an extensive building, where hundreds of workmen are employed during several years, the quantity must be quite sufficient to saturate certain parts of the structure beyond all remedy. Both these causes undoubtedly increase the presence of salts, &c., on such parts of the interior of buildings as are elevated above the influence of the ground. To show that dung and urine have long been considered to yield saltpetre abundantly, a proclamation of Charles I., in 1625, ordered all persons to save the urine of their families, and as much as they could of that of their cattle, to supply saltpetre for the manufacture of gunpowder; and in 1627 the saltpetre-makers were authorized to take away the ground of all dove-houses, stables, lairs, or others places where cattle were kept. There are many other sources by which salts are conveyed into or communicated to the walls of a building, but those already mentioned appear to be the most copious, and which may be considerably decreased.

Under ordinary circumstances it is scarcely possible to get rid of the various saline or deliquescent substances that have once been admitted into the walls of a building. The fixed alkalies (potash and soda) may probably be considered imperishable; no length of time can injure them; they may effloresce, or, more properly, they may crystallize on the surface of a wall, and totally or partially disappear again and again, as often as a change in temperature or of dryness or humidity takes place; these changes may be daily, or the salts may remain inactive during ages, and, from some favourable cause, a crop of crystals may be produced as flourishingly as if the wall had been recently erected. The only way to abate the evil, is to brush off the crystals, dry, whenever they appear in the most flourishing condition. If potash has been introduced into the walls, either from the putrefaction of animal or vegetable substances, such as have been named, or from other sources, however thick the wall may be, it will make its way to the surface, and then absorbing nitrogen from the atmosphere, which contains 70 or 80 per cent. of it, nitrate of potash (or saltpetre) is produced.

If we may imagine the possibility of salts in a crystalline state getting to the interior of a dry wall, beyond the influence either of moisture or considerable variation of temperature, in such case they would unquestionably remain crystallized as they were deposited; but such a state of things is never likely to take place: salts are generally communicated to a building in weak solutions; the water very gradually evaporates, carrying with it, from the interior of the wall, the molecules which compose salt. The solution having arrived at the surface, so as to be freely in contact with the atmosphere (which is always essential to crystalization), evaporation continues until the solution is sufficiently strong to crystallize, leaving only the mother-water in the wall, which is indicated by a certain dampness.

Lime, mortar, or some other sort of calcareous earth, seems to act as a vivifying principle to set the molecules of salt and water in action; if no lime were present, crystallization would certainly be much less active. An increase of temperature, or a humid atmosphere, will slowly dissolve the salts; if both these causes occur at the same time, liquefaction will be rapid, and the newly formed fluid will be absorbed into the wall as fast as the salts are dissolved. These changes will take place with every variation of atmosphere: a cool dry air, in a state of absolute rest or stagnation, is favourable to crystallization; a warm one, charged with aqueous vapour, will facilitate solution. It is extremely probable that several kinds of salts may be formed on the same wall, with their crystals intermixed so as to escape the discrimination of a casual observer, and that each will crystallize and liquefy at different times, according to the temperature and the quantity of moisture in the atmosphere: should this be the case, perhaps the wall may never appear perfectly free from efflorescence, so long as the various stimulants of air, moisture, light, heat, and other causes of attraction are in activity; and, since all attraction is mutual, it may readily be understood, that as the particles of water attract those of the alkaline salt, and retain them in solution, so the particles of alkaline salt will attract those of the water, and hold them in crystallization.

It is difficult to state with precision the relative power of different bodies to attract moisture from the atmosphere; that such power exists independently of temperature is scarcely probable, as thermal influence appears generally diffused over the face of nature. Some substances are more susceptible of sudden changes of temperature than others, and thereby may occasion a rapid precipitation of vapour, from the ærial or invisible state in which it exists in a warm atmosphere, to the fluid form on the surface of cold bodies; this circumstance arises solely from the solid mass of the wall requiring a much longer time to attain the same elevated temperature as the atmosphere. Bodies in contact with each other in due time arrive at one common temperature, by the hotter communicating the requisite proportion of the excess of its heat to the colder; the velocity of this communication varies in different bodies, some being quickly heated, and as quickly cooled; others undergoing these changes much more slowly. It is probable that the atoms or completely solid parts of all simple substances have exactly the same capacities for heat, and that the perfect or imperfect conducting power of substances will be proportioned to their porosity, sponginess, or the quantity of vacant space contained in their interstices. Dence bodies are generally the best conductors of heat; those which are the most porous, conduct it very imperfectly; the metals, which are substances of the greatest density, transmit heat most rapidly; stones and earthy substances conduct it more slowly; wood is a bad conductor; and the natural clothing of animals—fur, hair, feathers, &c., are inferior to every other material in their power of communicating heat. These remarks are applicable only to the conducting power of solid substances; liquids are all very bad conductors of heat; therefore, independently of evaporation, a cold damp wall will continue at a low temperature much longer than a cold dry one; and hence it will influence the condensation of vapours during a greater length of time than if it were dry.

Various circumstances seem to infer the probability that voltaic electricity, considered as a chemical agent, may act some part in conveying moisture from the atmosphere to the walls of a building. All substances naturally possess electrical energies, which are inherent in them; probably there may not be two substances, or even two distinct surfaces of the same substance, that are not in different electrical relations to each other; and it is a law of electricity that bodies in opposite states attract each other. Lime, sand, bricks, and hair, materials with which walls are usually constructed and plastered, are all, when dry, bad conductors; whereas water is a good conductor of electricity; and whenever the atmosphere, or water, or any part of the surface of a body, gains accumulated electricity of a different kind from the contiguous substances, there is an immediate tendency to bring the parts in contact. In this manner, other circumstances being favourable, floating aqueous vapours may perhaps be imparted to a wall, and absorbed into it by capillary attraction.

Electric influence, as connected with the preceding inquiry, is merely offered as a HINT, with the view of inducing scientific men to investigate the subject. Hitherto the public are not in possession of any facts which have immediate reference to this important object.

C. H. SMITH.

29, *Clipstone Street, June* 2, 1843.

OPEN SEATS IN CHURCHES.

So great is the present demand for good models of open seats, consequent upon the strong and fast-spreading dislike and condemnation of pews, and so numerous are the applications made to us for advice and assistance in restoring to churches their more Catholic arrangement for the accommodation of worshippers, that we propose to offer a few remarks on the proper proportions of this kind of seats, and the best method of fixing and disposing them.

The standards or ends of ancient open seats are generally distributable under three heads: (1) those which are sloped off with a shoulder and terminate in a boldly carved finial: (2) those that have an *elbow*, generally (as at Chesterton and Histon churches,) wrought into the device of a cumbent lion, dog, or griffin, but sometimes (as at Ketton, Rutlandshire) having a plain curvature; (3) those which are simply square or parallelogrammic panels. The last are usually the latest in date, though it may be observed in general of open seats, that they scarcely ever bear the marks of great antiquity. Whether any are to be found as early as the fourteenth century we do not know; but there is every reason to believe that, till the conclusion of the Edwardian period, the area of churches was quite free and unincumbered, and that if seats were used at all, they were moveable, and only placed in the Nave on occasion of service. The square panels are peculiarly common in Somersetshire, where they are carved in the richest and most varied devices, as may be seen in a valuable series of sixty-seven drawings of them recently presented to the Society.

The average height of the standards in ancient examples, measuring from the ground to the top of the finial, is from three to four feet, by from fifteen to eighteen inches wide. Those, however, described under the third head are usually from eighteen to twenty-four inches wide. In this case, the back is of the same height as the ends; in the others, the finial and shoulder project above the back, the capping of which is usually about two-and-a-half feet above the floor. The standards are of oak, seldom much less than three inches thick: and they are fixed by having the lower ends morticed into a *cill* or sleeper of oak, four or five inches square. The distance apart in the clear, that is, measuring from back to back, is usually three-and-a-half feet. Two-and-a-half feet is the very smallest distance that can be allowed. The seats should be not less than fourteen inches wide, and raised above the floor or pavement sixteen inches. These will be found the most comfortable as well as convenient proportions.

It is a great mistake to make the backs high or sloping. In the former case the support is against the shoulders, whereas it is required in the middle of the spine. In the latter a *lolling* or *easy-chair* position is induced, and the worshipper who kneels behind it is greatly incommoded by the projection of the upper part: it is moreover necessary that the seats be placed further apart when they have inclined, than when straight, backs. A kneeling-board should be placed at the back of each, so as to face the worshipper in the seat immediately behind, and serve as a desk for books. It is usually about seven inches wide, and raised one foot and a half above the floor. In some ancient seats this is placed only a few inches high, apparently for the worshipper to kneel *upon*, while the other is to kneel *at*. Very rarely both occur together.

Modern bench ends almost invariably labour under the following defects. (1) They are much too high. We have known them not less than six feet in height to the top of the finial, and they are seldom less than five. (2) They are usually of stained or painted deal. (3) They are put together with ironwork instead of wooden pegs. (4) They are not sufficiently substantial. (5) They either have block poppy-heads, or are carved of the most incorrect and scanty detail. (6) They are fixed to the flooring, and not pinned to cills. (7) They are generally of some ludicrous and fanciful design. We have seen *Norman* designs for bench ends, having semicircular tops, and panelled with semicircular arches with Norman capitals and shafts. Early-English open seats are equally absurd; since, as we have said, in the twelfth and thirteenth century the thing itself was utterly unknown.

We are very glad to find that the Oxford Architectural Society have just published some excellent lithographic prints of the open seats (in perspective, elevation and section) in Steeple Ashton and Hasely churches, Oxfordshire. These sheets will prove a valuable contribution to the cause which we advocate in common, and are of themselves a sufficient guide to those who are desirous of following approved examples.

It should ever be borne in mind that open seats are *actually cheaper than pens*, since this is an argument in their favour which is likely to have no little weight. The cost of a well-carved ordinary standard in oak, including the material, is about 30*s*. The finials *may* be worked separately, at about 10*s*. a-piece, and afterwards attached at the collar to the standards. Either may be executed to order by our wood-carver, Mr. Groom (62, Sidney Street, Cambridge), from a series of very excellent models from churches in the neighbourhood, casts of which are sold by him at 2*s*. each. We do not however recommend the latter expedient for general adoption. A far better way is not to have all the poppy-heads carved at once, but to work the block terminations gradually after the standards have been fixed in their proper position. Detached poppy-heads should always be well executed in oak, and if they are at first fastened to deal standards, these can be afterwards removed one by one, and 3-inch oak substituted in their places. A set of well-carved oaken standards is a peculiarly appropriate gift to a church.

We will suppose now that it is resolved to clear away from the area of an old church, the motley assemblage of *pens*,—painted, baize-covered, short, tall, square, oblong, flimsy deal or panelled oak, or whatever hideous variety they may present,—and to restore the ancient arrangement of uniform open sittings throughout. These, of course, will all face the east; and a central passage will be left down the Nave, and another parallel to it on each side next to the piers in the Aisles, so as to leave the bases perfectly free and unencumbered. Now, what is the best method of procedure after this happy consummation has arrived? First, then, we recommend the entire flooring (which is sure to be in a bad state from the vaults and encroachment of the pens) to be taken up, and a bed of concrete a foot in thickness to be laid uniformly over the whole of the interior area. In this a pavement of encaustic tiles, or at least, of squared stone slabs, must be firmly fixed. When this is done, and the mutilated bases and piers restored, some idea will be conveyed of the ancient appearance of our parish churches. Thus the ground will not easily be opened for graves, and the floor will be kept clean, dry, and wholesome; provided, of course, that proper attention be paid to the external drainage and clearance of the soil from the earth-line. Upon this pavement cills or sleepers of oak should then be laid *loose*, in a direction from east to west; and to these the standards should be mortised at such intervals that the backs may be, at the very least, 2 ft. 6 in. apart in the clear. If a boarded floor be insisted upon,—as it often will be, from an ignorance of what a dry and level pavement beneath the feet really is,—stout planks may be laid over and upon the pavement from cill to cill, into which they may be made to fit by a groove, in such a manner that they can at any time be readily removed for the purpose of cleaning and thoroughly drying the floor underneath. Thus also, if the occupants of one seat consent to try the withdrawal of the boards, and find no inconvenience therefrom, others will certainly follow the example, and the plan which we have ever recommended, namely, to have a stone or tiled floor under the seats as far preferable to boarding, will be gradually achieved. We can assure our readers that we have seen many ancient churches in which no boarding has ever been placed under the open seats, and the appearance is much better, and the comfort to the worshipper certainly not less, for the absence of it.

Name of Place.	Apart.	Total Height of Standards.	Width of Standards.	Width of Seat.	Height of Seat.	Height of Back.	Height of Kneeling Board.	Width of ditto.
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	in.
Ketton, Rutland ..	3 7 / 2 11	4 0	1 6	1 3	1 3	2 9	1 9	8
Boston, Lincolnshire ..	2 6	2 7½	1 3	10-11 in.	1 4	2 6		
Chesterton	3 0 / 3 6	3 3	1 5	11-12-13 in.	1 4	2 4	1 6-7	6
Impington	2 8	3 6	1 6½	1 0	1 4	2 3	0 9	7
Histon	3 6 / 3 2	3 2	1 4-5	12-14 in.	1 6	2 5		
Fletton, Huntingdon ..	3 7	3 6	1 2	0 11	1 5	2 6	1 6	9
Stanground, Huntingdon ..	3 6	3 7	1 2	0 11	1 4	2 7		
Broomfield, Somerset ..	2 10	2 9	1 4	1 0	1 6½	3 1½	0 6	5½
Bishop's Lyd, Somerset ..	2 6—2 8	2 7	1 4	0 11	1 5	3 0½	0 8	8
Cothelstone, Somerset ..	2 11	2 9	1 4	1 0	1 5½	2 10	0 9	7
Bagborough, Somerset ..	2 3½	2 10	1 4	0 11½	1 8	3 1	0 10	5½
Fulbourn	2 4	3 10	1 2½	0 11	1 5	2 7	1 9	4½
Landbeach	3 9 / 3 2	3 2	2 1	1 0	1 4 / 1 6	3 2	1 10	9½
Comberton	4 0 / 3 10 / 3 8	3 3	2 0	1 1	1 4 / 1 9	3 3	1 6 / 1 10	7
Toft	4 0 / 3 6	3 5	1 7	1 1.2	1 3 / 1 6	2 4.6	1 7	7
Harlton	3 4 / 3 6-7	2 6½ / 3 0	1 9 / 2 0	0 10 / 1 0	1 4 / 1 7	3 4 / 3 6-7	1 7 / 2 0	7

We add some measurements of ancient seats, taken from several counties, which will probably be serviceable to many of our readers. We would call attention to the remarkable uniformity of proportion which generally characterises those of the same kind. Indeed it would be useless to multiply examples to a great extent, since any important difference from the above admeasurements must be regarded as an exception. In conclusion, we would urge all who are about to replace open seats in their churches to follow faithfully *ancient models*, which are, happily, even yet sufficiently abundant in our parish churches.—*Ecclesiologist*.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

June 13.—The PRESIDENT in the Chair.

"*Description of a Plan, adopted for carrying off an accumulation of Water from the Warehouses, Cellars, &c., near the Wet Dock at the Port of Ipswich.*" By George Hurwood, Assoc. Inst. C. E.

The paper states that in consequence of the formation of the wet dock at Ipswich, the water from the land-springs, which was formerly carried away by the river, accumulated to such an extent, as to cause serious inconvenience to the owners of the warehouses, cellars, &c., many of them being beneath the level of the ordinary tides. It was difficult to find a remedy for this, as nearly the whole of the line, affected by the water, was at so low a level, that a discharge could only be effected at the lowest ebb of the tide, and a general sewer could not have been constructed at a moderate expense, because from the lowness of the level, water would have accumulated constantly in it, and any casual increase from rain or other causes, would have been sufficient to inundate the adjoining buildings.

The plan designed by the author, and which has been executed, had for its object, the construction of a sewer which should drain these buildings alone, and at the ebb tide should carry off the accumulated water, being at the same time of sufficient size to contain the water, which was prevented from being discharged by the flowing tide. It was required therefore to be water-tight, and branch drains were necessary from all the points where water penetrated.

To insure the success of the plan, every precaution was taken for preventing the influence of the tide in the general sewer, retarding the discharge or operating upon the lateral sewers.

At the end of the main sewer was placed a cast-iron frame, upon which were hung three tide-flaps with brass facings, accurately fitted, and balanced by levers and counterweights. By this means the water was discharged at any height, and without any considerable head of water being required to open the flaps. Each cellar was connected with the main drain by an iron pipe, with a well-balanced valve at its end, so that the water could have an easy exit; but as soon as any accumulation within the sewer occurred, the valves closed.

The sewers were built of brick, in mortar made from blue lias lime. The dimensions varied from 12 inches to 24 inches in diameter, and the cost of the latter size was 12*s*. 8*d*. per yard, including excavating, laying, filling, &c.

The plan is stated to have proved very successful, and as particular regulations are enforced, to prevent any admission to the sewers, of other than the water which filter through the natural strata of the chalk-basin, the water in the sewers is fit for domestic or manufacturing purposes.

The communication is illustrated by a drawing, showing the situation of the town and dock of Ipswich, with the extent of the lines of sewers, and the details of their construction, and that of the tide and other flaps.

"*On the Formation of Embankments for Reservoirs to retain Water.*" By Robert Thom, M. Inst. C. E.

After describing a model, designed to show that the proper slope for reservoir embankments, should not be less than three to one on the water-face, and remarking that waves act more severely on the pitching or paving of the inner face, in proportion to the steepness of the slope, the author proceeds to describe in detail the mode of forming embankments. The foundation is excavated to such a depth as is found firm and capable of preventing the passage of water, then spreading alternate layers of puddled peat, or alluvial earth and gravel, and beating them together with wooden dumpers, until they are completely mixed; the slopes are covered with a puddle made with small stones or furnace-cinders mixed with clay, so as to prevent the possibility of moles or other vermin penetrating into the embankment. He condemns the practice of forming embankments with puddle-trenches, and refers to many reservoirs made by him at Greenock, Paisley, and elsewhere, the banks of which have stood the test of time without having any puddle-trenches in them, and particularly mentions one at Greenock which remained firm and sound, after a rush of water passing over it at a height of ten feet, caused by the breaking down of the embankment of a reservoir situated about 150 yards above it. He recommends, instead of the puddle-trenches, that the whole of the inner part of the embankment should be made water-tight during the formation of it, by which means it will more effectually resist either any casual injury, or any effect of the swelling of the puddle-trench. The paper is entirely of a practical nature, and is intended to illustrate the author's peculiar views founded on his long experience. It is accompanied by a diagram of the model used in his experiments.

June 20.—The PRESIDENT in the Chair.

A Pressure-Gauge was presented for the Museum of the Institution by Alfred King, M. Inst. C. E.

This gauge, which has been used at the Liverpool gas-works for more than ten years, for indicating small amounts of pressure, consists of a close cistern containing water, in which is a cylinder having in it a hollow float, connected with a balance-weight, by a fine silken cord, passing over a pulley, on the axis of which is fastened a pointer, one end of which marks the amount of pressure upon a dial divided in such a manner, that as each division is equal to a column of water of $\frac{1}{10}$th of an inch, a difference equal to $\frac{1}{50}$th, or even $\frac{1}{100}$th of an inch, may be estimated.

The action is very simple, the float being elevated by the rising of the water within the cylinder, when the surface is depressed in the cistern by the pressure of the current of gas from the inlet pipe.

The description was illustrated by a diagram showing the internal construction of the gauge.

"*Description of a Machine for raising and lowering Miners.*" By John Taylor, M. Inst. C. E.

The author states that the great depth in which the copper and tin mines, in Cornwall, and in Germany, had been worked, had drawn simultaneously in the two countries, the attention of engineers to some mode of facilitating the ascent and descent of the miners, whose strength was exhausted, and their health seriously affected, by the fatigue of going to and returning from the scene of their labours by nearly vertical ladders, as the men could not be raised and lowered by the rope of the winding engines, as in the coal districts. The Polytechnic Society of Cornwall offered premiums for machines for effecting this object, and in 1834 three prizes were respectively awarded to Mr. Michael Loam, Capt. W. Nicholas, and Capt. W. Richards for plans, the two first of which embraced the principle which has since been adopted with modifications, both in Germany and in Cornwall. A premium was also offered by Mr. Tremayne for any new method, or for the most available improvement on the former plans, and was awarded in 1838 to Mr. John Phillips for a method, differing, however, from that which has been put in practice. About this time it was ascertained that a machine, somewhat similar to that designed by Mr. Michael Loam, had been applied with success to one of the deepest mines in the Hartz; and drawings, with a description, were published in the Report of the Polytechnic Society of 1838. Mr. Charles Fox also commenced a subscription, for the purpose of awarding a sum of money to any proprietor of mines, who would first bring into active operation, efficient machinery adapted for the purpose in question.

At length the adventurers of the Tresavean copper-mines, undertook to erect a machine from the designs, and under the superintendence of Mr. Michael Loam: it was first used for a depth of 27 fathoms, on the 5th of January, 1842; has since been extended to 264 fathoms; and it is now contemplated to carry it to the lowest part of the mines, which is 288 fathoms deep.

The machine, which is worked by a steam-engine, with a cylinder of 36 inches diameter, consists of two rods, to which are attached, at intervals of 6 feet throughout their length, platforms upon which the men stand: these rods receive an alternating motion from two cranks, which give them a stroke of 12 feet; the men, either in ascending or descending, step from one platform to the other, as the rods remain for an instant almost stationary, when the cranks are going over top and bottom centres; and as the platforms are half the length of the stroke apart, one set of men can ascend while another set is descending, without at all interfering with each other. Each rod makes three strokes per minute; and when once the platforms are filled with men, they are landed at the rate of six men per minute, either going up or down; the speed of travelling being about 72 feet per minute, or 240 fathoms in 20 minutes. By the ordinary mode of ascending by ladders it would have occupied 48 minutes to mount from the same depth, as the usual speed is about 30 feet per minute, so that more than 50 per cent. of time is saved, independent of the diminution of fatigue.

The rods at the Tresavean mine act vertically for the first 70 fathoms, below which they follow the direction of the vein, diverging from the perpendicular from 6 inches to 18 inches in 6 feet. The action of the apparatus is stated to be perfectly successful; no accident has occurred in the use of it, and the miners are convinced of the safety as well as the ease afforded by it.

The paper is illustrated by two drawings by G. B. W. Jackson, Grad. Inst. C. E., showing the details of the machine; they are copied by permission of Sir Henry De la Beche, from the model now in the Museum of Economic Geology.

Remarks.—Mr. Taylor observed, that there was an extraordinary coincidence of time in the appearance of this invention, as the public attention, both in Germany and in England, seemed to have been directed to the subject simultaneously, without any correspondence between the engineers of the two countries. There had been many competitors for the premiums offered in Cornwall for the best method, but the only successful plans were those mentioned in the paper; and the machine therein described was a combination of the plan proposed by Mr. Loam and that actually in use in the Hartz mines.

Mr. Buddle recollected many years ago seeing a model of a somewhat similar machine, which had been in use in Germany for fifty years: it consisted of two rods, upon whose sides were hooks, at given distances, which on receiving a reciprocating motion were alternately engaged on the opposite handles of the "kibble" containing the ore, which was thus raised to the surface; it was probable that the idea of raising the miners had been taken from this old machine.

Mr. Taylor replied that he did not think Mr. Loam knew of the existence of any machine of the kind, and that the first impulse given to the subject was by the premiums offered for the best method, which had directed the attention of engineers to it. An American machine somewhat similar to that described by Mr. Buddle had been exhibited in London by Mr. Slade; it was designed for raising ore and water, but Mr. Taylor thought it applicable to raising the miners, and directed the attention of the patentee to the subject, but the machine was not successful.

In answer to a question from the President, Mr. Buddle said that the system was not applicable to the mines at Newcastle, as the men went up and down by the rope. By the use of guides and slides, the rate of drawing the coal to the surface was generally about 18 feet per second, which was not, however, considered sufficient, and a greater velocity was contemplated.

"Description of Annular Valves used for Pumps for Water-works, &c." By Richard Hosking.

The annular valve consists of three concentric rings, arranged pyramidally, and resting one upon the other, thereby affording a free passage for the water around the circumference; the upper ring is attached to a stalk, and the two lower ones have internal wings, which serve as guides when the rings are in motion.

The chief advantages afforded by these valves are stated to be an increase of water-way and a reduction of concussion, for as the concussion occasioned by the shutting of pump-valves is in proportion to the surface in contact, and the square of the height or distance passed through while in the act of shutting, the greater the number of parts of which the valve is composed, the greater will be the freedom of water-way, and consequently the burthen on the engine and the concussion will be proportionally diminished.

These valves were first used in two 30-inch pumps at the Waldersea Drainage, near Wisbeach, and they have since been introduced into the Royal Polborro Consols Mine and the Vauxhall Water-works.

The description is illustrated by a drawing, showing the construction of the internal parts.

"On the construction of Valves used in Pumps for raising Water." By Samuel Collett Homersham, Assoc. Inst. C. E.

The author first describes the original leather flap valves which are in common use, shows their defects, the modifications which have been introduced in them, and the reasons why a better kind of valve was necessary, particularly for large pumps appended to steam engines, quoting from Mr. Wicksteed's work on the Cornish engine, [1] that by the closing of the valves at the East London Water-works, the whole of the engine-house was shaken. This led to the application, by Messrs. Harvey and West, of a modification of the double-beat steam valve,[2] only making it self-acting; by this, it is stated, the concussion is so much reduced that little inconvenience is felt from it. No air is required to be admitted beneath, as is frequently the case with common valves, consequently the pump when at work lifts its full complement of water.

The author states that in this valve the diameter of the top seating is somewhat smaller than the lower, for the purpose of allowing a sufficient area for the pressure of the water to act against in lifting it. He remarks that the pressure required to open these valves appears to vary from 2 lb. to 5 lb. per square inch, and that it does not seem to follow any uniform rule. The seatings which answer best are composed of pieces of wood fitted in a groove with the fibres in a vertical position. The principal advantages of this kind of valve, as to durability, slight concussion on closing, facility of repair, &c., are then enumerated; but it is urged against them that the passage for the water is circuitous, and therefore the power required to force the water through, is considerable, and that in a large valve the height to which it rises is too great.

He then states that Mr. James Simpson, who has had great experience in the difficulties attendant upon the use of large pumps, some years since conceived the idea of obtaining valve openings nearly equal to the full area of the clack chambers, by means of a conical valve formed of rings shutting down upon each other; this was afterwards modified into a valve with separate seatings for the rings to fall upon, allowing a passage for the water both inside and outside the rings, thus obviating the necessity of their lifting more than one-half the space of the width of the openings in the seating, and it was found that in valves of large diameter, by increasing the number of openings, the height of lifting in opening could be further reduced; the closing was necessarily more rapid, the concussion was nearly avoided, and the passage of the water was rendered direct and free from bends and interruptions. A valve on this construction was adapted to the engine at the Lambeth Water-works, and it was found on setting it to work, that a counterbalance weight of upwards of one ton, required to be moved from the pump side of the beam, to some distance on the steam piston side; the saving of steam consequent on this and the action of the valve, amounted to about seven per cent. of the quantity previously used. The same effect was observed at the Chelsea Water-works, where similar valves were substituted for those of Messrs. Harvey and West.

It is stated that in consequence of the galvanic action between the brass rings and the iron seatings, wood seatings were adopted, and have been found very preferable. The dimensions of all these valves are given in detail, and also of several other large valves which have been made.

The question of the proper weight of valves in proportion to the height of the column is then examined at great length, and the following rule is given: "The mean velocity of the water in feet per second through the valve, being ascertained, one-half more is added to this velocity and considered as the maximum velocity of the water through the valve; and the height of the head of water being found that would produce this velocity, every $1\frac{3}{4}$ inch of such height is considered equal to one ounce weight avoirdupois, acting upon each square inch of the area of the valve, against which the water impinges, in its passage to the pump barrel, allowance being made for the difference of the weight of the ring, when immersed in water. compared with its weight in the air." By this rule, it was found that a considerable weight required to be added to the valves which had been erected, and that addition rendered the concussion scarcely perceptible.

The author advocates a large area in the valve passages for the water to flow through, in order that the power of the engine may not be expended in putting the fluid in motion to fill the pump-barrel. He states that the proper area, depends on the diameter of the pump and the working velocity of the plunger; and that if the maximum velocity of the water up the suction pipe, is not allowed to exceed 6 feet per second, but little advantage will in ordinary cases be gained by reducing that velocity; that an increase of speed is often unavoidable, but that it causes a great expenditure of power; and he quotes Mr. Wicksteed's experiments in support of this position. He urges from this, the importance of reducing the velocity of the water in entering and in quitting the pump barrel; and also that the lift of the valve should not exceed 2 inches, and should be as much less as possible, as the valve in that case closes quickly before the return stroke of the engine commences. Short lifts are then examined, and it is stated that the valves will not close rapidly, unless they are weighted sufficiently to resist the maximum velocity of the water flowing through them and are carefully adjusted to it; and that if they are too heavy there is a loss of power in working the pumps.

Several modifications of these valves, adapted to various uses, are then described, and the author states that his intention is, to lay before the Institution, an account of such valves as had been found to answer well in practice; and to direct attention to the correct principles for constructing them of proper proportions and of durable materials.

The paper is illustrated by eight detailed drawings of different constructions of valves, and by three models of some which have been in use and are found successful.

Remarks.—Mr. Simpson corroborated the account of the advantages of the valves described in the paper; he had found them practically useful and economical.

Mr. Wicksteed said that with Messrs. Harvey and West's improvements, a valve 4 feet in diameter which formerly rose between 4 inches and 5 inches, now only lifted $1\frac{1}{4}$ inch; the concussion was diminished and the durability insured; the latter was increased by substituting wooden faces for metal ones; by this means also the corrosion, attendant upon the contact of two metals, was avoided. One of these valves had already lasted three years, and was still quite good. The principal improvement consisted in making the water pass all round the circumference, instead of through the centre of the valve. The difficulties which had been experienced at Old Ford had not arisen from the form of the valves,[3] but from the situation in which they were placed; he argued, therefore, that when experiments were made upon these valves, new boxes and suction pipes should be made expressly for them, and they ought not to be adapted to the pipes from whence the old shaped valves had been taken. He approved particularly of the form of the double-beat valves as possessing great strength, and reducing the liability to fracture.

Mr. Taylor said, that the meeting was much indebted to the author, for laying down positive rules and principles, on a subject which had not hitherto

1 "An Experimental Inquiry concerning the Cornish and Boulton & Watt Pumping Engines," by Thomas Wicksteed. Weale, London, 1841.

2 See drawing and description of these valves in the Journal, Vol. III, p. 41.

3 We rather suspect that Mr. Wicksteed must have been misunderstood in his remarks, for we understood that he alluded to the use of two valves, and that he said the lower valve rose 4 or 5 inches, while the upper one rose from $1\frac{1}{4}$ in. to $1\frac{3}{4}$ in. only.—[Ed. C. E. & A. Journal.]

been sufficiently attended to. He fully approved of those forms of valves in which the area was divided into several openings; the loading the valve proportionably was also of importance. All the ring valves, among which he would include that of Mr. Hosking, tended to diminish the concussion; but however good they might appear theoretically, there were some practical objections against most of them; for instance, Harvey and West's valve was not applicable for mines, because, as the two lifting faces were connected, a chip or any sand being interposed between either of them would cause considerable leakage in both; the ring valves were not liable to this objection, and therefore were preferable for mines or situations where the water contained any foreign substances. The old butterfly leather valve had been much improved, and recently a modification of it had been introduced which promised to be very effective. The area of the valve was divided into eight compartments, each covered by a triangular flap of leather, hinged to the circumference of the bucket, and all meeting in the centre on a raised apex. By this arrangement nearly the whole area of the pump-valve was opened; the cost of construction was also diminished, because, instead of cutting the large flaps only out of the finest and largest hides of leather, small pieces could be used: valves thus constructed, had been in use in mines for upwards of seven months, without repair. The improvements in the valves had produced a corresponding increase in the height of the column of the pumps: it formerly was about 15 fathoms; Woolf had gradually increased it to 40 fathoms; and now a column of 50 fathoms was sometimes used. He was an advocate for giving a very large area to the suction-pipes; for instance, in one mine under his direction, to a valve 20 inches in diameter, two suction pipes, each of 20 inches diameter, had been adapted, with great advantage to the engine; the pump drew more water and worked much more steadily.

Mr. Parkes remarked, that the concussion arising from the closing of the valves of low-lift pumps, was more destructive than in the high-lifts; an entirely different system was therefore pursued in pumping. The engine started very rapidly, and was generally worked much faster, which altered the condition of the pumping. At the engine of the Waldersea drainage, near Wisbeach, there was a pump of 6 feet diameter, with a length of stroke of 8 feet, the valves were formerly destroyed more rapidly than in any mine in Cornwall; recently, Mr. Hosking, had adapted to it a large box, having in the centre a valve of 30 inches diameter, and around it five other valves, the sum of the area of the six valves being greater than that of the pump: the result was a great diminution of concussion, and consequent increased durability of the valves.

Mr. Glynn agreed with Mr. Taylor, in thinking that Messrs. Harvey and West's valves, were not so well adapted for mining purposes as they were for water-works, or for situations where only clean water was passed through them. Mr. Darlington had introduced a modification of the valve, which he thought would be very efficacious; it was being constructed by the Butterley Iron Company, and he would send a description of it to the Institution. This principle of large valves had been extended to blast engines; the size of the air-valves having been much increased, a corresponding advantage had been found in their duration, as well as in the work of the engine.

June 27.—The PRESIDENT in the Chair.

"On the present State of the Streets of the Metropolis, and the importance of their amelioration." By Charles Cochrane, President of the Association for the Promotion of Improved Street Paving, &c.

This paper first refers to a Commission formed by the present Government, "for inquiring into and considering the most effectual means of improving the Metropolis, and of providing increased facilities of communication therein;" also to a Report of a Committee of the House of Commons, which recommends "that an institution should be formed expressly for ascertaining, by a succession of experiments, the best mode of constructing roads and keeping them in repair."

A brief history of the different kinds of carriage-ways and foot-pavements, is then given, showing that the resources of art and science have been but little consulted in their construction, which is illustrated by the system of making macadamized roads, their formation being nearly dependent upon the amount of traffic upon them. It is also stated that few, if any, improvements have been made in the method of forming granite pavements; the system practised twenty years since being nearly the same as at present, which is, to imbed the stones in the earth by means of mere manual strength, although, of late years, the aid of grouting has been occasionally brought into use. That in foot-pavements the same fault is perceptible, namely, the want of a good foundation, as the masons generally seem to think, that so long as the edges of the flags are well covered with mortar, and the work when completed presents an uniform surface, the chief objects are accomplished.

It is stated that wood paving, of which 100,000 yards have been laid down in the metropolis, appears likely, from the successful trials which it has undergone, to be generally adopted, the only objection against it being, that it is slippery in wet weather; this evil is chiefly attributed to the mud which is brought from the other kinds of paving and allowed to remain on it. In all other respects, wood appears a superior material to any other hitherto employed, for making roads, both as regards its general economy and durability, as well as its facility of traction, and more especially its extreme cleanliness.

The question of cleansing streets is then entered upon, when it is shown that the oftener streets are cleansed, the less mud is created, whilst the attendant expenses are not increased and the roads are kept in better preservation. From calculations made by the municipal authorities at Manchester, on the relative advantages of machinery and manual labour, in cleansing the streets, the results of which are given in a table, it is shown that the extent of surface swept is the same, although not the extent of streets, arising from the more or less frequency of sweeping over the same surface; so that by cleansing the streets with Whitworth's street-sweeping machine, three times a week, the quantity of mud produced on the surface is five times less, than when they were swept by hand, twice in three weeks, and thirteen times less than when swept but once a week.

	Number of Yards swept.	Number of Loads removed.	Average No. of Ys. swept to produce a Ld.
District swept by machine three times per week	5,500,000	1,285	4,338
By manual labour:—			
Twice in 3 weeks, township, 1841-2	5,500,000	6,400	859
Once a-week „ 1838-9	5,500,000	17,000	343

The losses caused by the dust and dirt in the streets are stated to be very great; Mr. Mivart, of Mivart's Hotel, estimates his actual loss at about £865 per annum, whilst shop-keepers in Oxford-street and Regent-street, state that they lose annually from £30 to £300 per annum, by the destruction of their goods by the dust, &c.

Some suggestions are given for improving, repairing, and cleansing the streets, and it is stated that there are abundant means at present available, for keeping them comparatively free from mud, if machinery was properly employed.

"On the relative merits of Granite and Wood Pavements and Macadamized Roads; derived from actual experience." By D. T. Hope (Liverpool).

In this communication the author alludes to the inefficiency of many of our finest specimens of paving, arising from the desire of reducing the outlay, but which, in reality, are executed and maintained at a great expenditure, without securing the advantages which the material is capable of affording, or the qualifications requisite for streets;—and to the cleanliness, comfort, and true economy, in having the work performed in the best manner, and employing material best calculated for producing all those advantages, which may be reasonably expected in streets of the present day.

The following requisites that a good road or pavement ought, in some degree, to possess, are laid down down as a standard, by which the respective systems are compared; and a certain value (according to the experiments on the several modes) attached to each, for the convenience of more obviously contrasting their several qualities, viz.—

1. A solid and compact structure, capable of resisting the effects of traffic, without being cut up into ruts and inequalities from other causes than mere abrasion.
2. Not requiring to be frequently repaired.
3. As much elasticity in the material, as may be useful in aiding the power in draught.
4. A firm and smooth surface, that the power employed may not require to be ever vaying.
5. Although comparatively smooth, to be free from slipperiness.
6. To afford a sure foot-hold for the horse.
7. Not liable to be seriously affected by the changes of the atmosphere, or by repairs.
8. An absence of mud and dust.
9. A freedom from noise.
10. To afford economy in transit.
11. An economy in the construction and maintenance, consistent with the preceding advantages.
12. Not subject to rapid abrasion.

It is shown that macadamizing has few, if any, advantages for public thoroughfares—arising from its rapid abrasion, the frequent application of new metal—the uncertainty of its condition, varying with every change of weather—the abundance of mud and dust—and the great expence of maintenance; and from the power employed in draught requiring to be so variable, that the cost of transit is not only increased, but the horse is often compelled to exert more power at one time or in one part of the street, than should ever be required of it. And also, that the advantages which may be claimed for macadamizing in streets, are attainable in other descriptions of paving, if proper attention be paid to their construction.

It is contended, from experience, that granite pavement can be laid down, so that the results will be superior to macadamizing, not only as regards economy of construction and maintenance, and power in draught, but also of the other qualities, with the single exception of noise, which, it is shown, need not be so great a disadvantage as to warrant its rejection; if the sets be well dressed, and properly laid, on a sufficient substratum, and if the sets are not used too broad, a sure foot-hold for the horse can at all times be had, besides contributing more to the solidity of structure, than the broad and shallow blocks so frequently employed.

By experiment, it appears that wood is a more efficient and durable material for paving, than stone of any description, and that it is capable of affording all the qualities required for our finest streets. In order to ascertain the best position of the fibre, for securing all the advantages which wood can afford, a minute table is given of the results of experiments, during a period of eighteen months, upon blocks with the fibre placed vertically and horizontally, and leaning at the intermediate angles; from this it appears that vertical blocks sustain less abrasion and less injury than those in any other position. A sound concrete substratum, is held to be an essential feature, in the successful application of wood for paving; and if blocks in a vertical position, be laid down in a dry state, with close joints, the surface and structure can be maintained, under any change of weather, in a condition to resist any amount of traffic and heavy loads. It is shown that cohesion is not a fluctuating quality, for the blocks in the pavement are, in reality, not liable to become wet and dry with atmospheric changes. In wet weather they absorb as much moisture as they can contain, which increases their volume, and from which moisture they are never after totally free, even in the driest weather, as they still remain damp, and retain an excess of volume over the dry state in which they were originally laid down, more than sufficient for supplying perfect cohesion under any change of the atmosphere. It is also shown that wood does not produce mud and dust, and that slipperiness is therefore foreign to wood pavement; that its economy in maintenance, power in draught, cleanliness and comfort, are favourable recommendations;—and that wood is an efficient material for paving, whether subjected to wet, dry, or frosty weather.

Tables are then given, showing the results of the experiments in a condensed form, and from which it appears, that, the power of traction being in each 100 lb., the weight drawn on a level macadamized road, is on an average 27 cwt.; on a level granite pavement, 30½ cwt.; and on a level wood pavement 54¾ cwt.

"*On the Ventilation of Lighthouse Lamps; the points necessary to be observed, and the manner in which these have been or may be attained.*" By Professor Faraday, L.L.D., Hon. Mem. Inst. C. E., &c.

The author states that the fuel used in lighthouses for the production of light is almost universally oil, burnt in lamps of the Argand or Fresnel construction; and, from the nature and use of the buildings, it very often happens that a large quantity of oil is burnt in a short time, in a small chamber exposed to low temperature from without, the principal walls of the chamber being only the glass through which the light shines; and that these chambers being in very exposed situations, it is essential that the air within should not be subject to winds or partial draughts, which might interfere with the steady burning of the lamps.

If the chamber or lantern be not perfectly ventilated, the substances produced by combustion are diffused through the air, so that in winter, or damp weather, the water condenses on the cold glass windows, which, if the light be a fixed one, greatly impairs its brilliancy and efficiency, or, if the light be a revolving one, tends to confound the bright and dark periods together. The extent to which this may go, may be conceived, when it is considered that some lighthouses burn as much as twenty, or more, pints of oil in one winter's night, in a space of 12 or 14 feet diameter, and from 8 to 10 feet high, and that each pint of oil produces more than a pint of water; or, from this fact, that the ice on the glass within, derived from this source, has been found in some instances an eighth, and even a sixth, of an inch in thickness, and required to be scraped off with knives.

The carbonic acid makes the air unwholesome, but it is easily removed by an arrangement which carries off the water as vapour. One pound of oil in combustion produces about 1·06 pounds of water and 2·86 pounds of carbonic acid.

The author's plan is to ventilate the lamps themselves by fit flues, and then the air inside the lantern will always be as pure as the external air, yet having closed doors and windows, a calm lantern, and a bright glass.

In lighthouses there are certain conditions, to which the ventilating arrangement must itself submit, and if these are not conformed with, the plan would be discarded, however perfect its own particular effect might be. These conditions are chiefly, that it should not alter the burning of the oil or charring of the wicks—that it should not interfere with the cleaning, trimming, and practice of the lamps and reflectors—that it should not obstruct the light from the reflectors—that it should not, in any sudden gust or tempest, cause a downward blast or impulse on the flame of the lamp—that, if thrown out of action suddenly, it should not alter the burning; and, added to these, that it should perform its own ventilating functions perfectly.

Lighthouses have either one large central lamp, the outer wick of which is sometimes 3¾ inches in diameter, or many single Argand burners, each with its own parabolic reflector. The former is a fixed lamp; the latter are frequently in motion. The former requires the simplest ventilating system, and is thus described:—

The ventilating pipe or chimney is a copper tube, 4 inches in diameter, not, however, in one length, but divided into three or four pieces: the lower end of each of these pieces, for about 1½ inch, is opened out into a conical form about 5½ inches in diameter at the lowest part. When the chimney is put together, the upper end of the bottom piece is inserted about ½ an inch into the cone of the next piece above, and fixed there by three ties or pins, so that the two pieces are firmly held together; but there is still plenty of air-way, or entrance, into the chimney between them. The same arrangement holds good with each succeeding piece. When the ventilating chimney is fixed in its place, it is adjusted, so that the lamp-chimney enters about half an inch into the lower cone, and the top of the ventilating chimney enters into the cowl or head of the lantern.

With this arrangement it is found that the action of the ventilating flue, is to carry up every portion of the products of combustion into the cowl; none passes by the cone apertures, out of the flue into the air of the lantern, but a portion of the air passes from the lantern by these apertures into the flue, and so the lantern itself is in some degree ventilated.

The important use of these cone apertures is, that when a sudden gust, or eddy of wind, strikes into the cowl of the lantern, it should not have any effect in disturbing or altering the flame. It is found that the wind may blow suddenly in at the cowl, and the effect never reaches the lamp. The upper, or the second, or the third, or even the fourth portion of the ventilating flue might be entirely closed, yet without altering the flame. The cone junctions in no way interfere with the tube in carrying up all the products of combustion; but if any downward current occurs, they dispose of the whole of it into the room, without ever affecting the lamp. The ventilating flue is, in fact, a tube which, as regards the lamp, can carry everything *up*, but conveys nothing *down*.

In lighthouses with many separate lamps and reflectors, the case is more difficult and the arrangement more complicated, yet the conditions before referred to are more imperatively called for, because any departure from them was found to have greater influence in producing harm. The object has been attained thus:—A system of gathering pipes has been applied to the lamps, which may be considered as having the different beginnings at each lamp, and being fixed to the frame which supports the lamps, is made to converge together and to the axis of the frame by curved lines. The object is to bring the tubes together behind the reflectors, as soon as convenient, joining two or more into one, like a system of veins, so that one ventilating flue may at last carry off the whole of the lamp products. It is found that a pipe ⅞ths of an inch in diameter is large enough for one lamp; and where, by junction, two or more pipes have become one, if the one pipe has a sectional area, proportionate to the number of lamps which it governs, the desired effect is obtained.

Each of the pipes ⅞ths of an inch in diameter, passes downwards through the aperture in the reflector over the lamp, and dips an inch into the lamp-glasses; it is able to gather and carry off all the products of combustion, though, perhaps, still 2 inches from the top of flame, and therefore not interfering in any respect with it, nor coming as a shade between it and any part of the reflector: the flame and reflector are as free in their relation to each other as they were before. Neither does this tube hide from the observer or mariner, a part of the reflector larger than about 1½ square inch of surface, and it allows of a compensation to two or three times the amount; for, when in its place, all the rest of the aperture over the lamp, which is left open and inefficient in the ordinary service, may be made effectual reflecting surface, simply by filling it up with a loose, fitly formed, reflecting plate.

At this termination of the ventilating flue an important adjustment is effected. If the tube dip about an inch into the lamp-glass, the draught up it is such that not only do all the products of combustion enter the tube, but air passes down between the top edge of the lamp-glass and the tube, going, finally, up the latter with the smoke. In this case, however, an evil is produced, for the wick is charred too rapidly; but if the ventilating flue descends until only level with the top of the lamp-glass, the whole of the burnt air does not usually go up it, but some passes out into the chamber, and at such times the charring of the wick is not hastened. Here, therefore, there is an adjusting power, and it was found by the trials made, that when the tube dipped about half an inch into the lamp-glass, it left the burning of the lamp unaltered, and yet carried off all the products of combustion.

The power already referred to, of dividing a chimney into separate and independent parts, and yet enabling it to act perfectly as a whole, as shown in the single central chimney, was easily applicable in the case of several lamps, and gave a double advantage; for it not only protected the lamps from any influence of down draught, but it easily admitted of the rotation of the system of gathering flues, fixed to the frame sustaining the lamps and reflectors in a revolving lighthouse, and of the delivery of the burnt air, &c., from its upper extremity into the upper immoveable portion of the flue. This capability in a revolving light is essential, for in all, the support of the frame-work is of such a nature, as to require that the upper part of the flue should be a fixture.

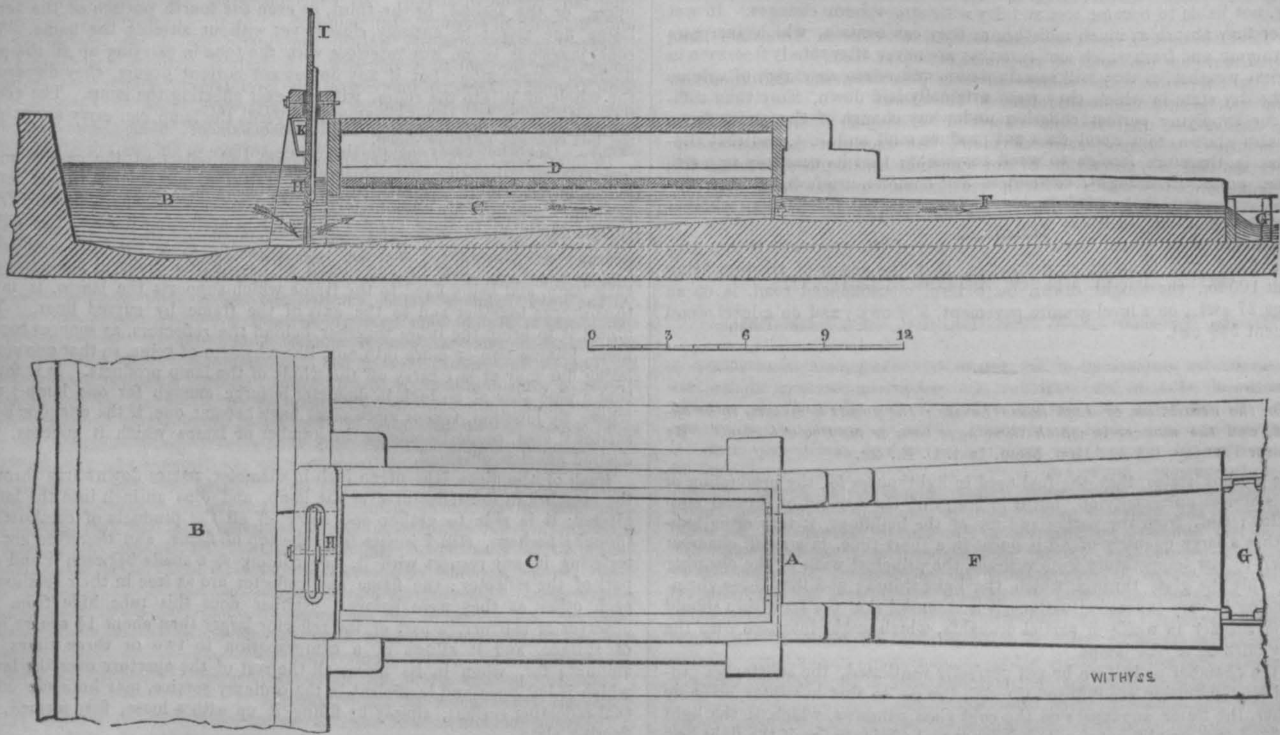
The author explains that it is as an officer of the Trinity House, and under its instructions, that he entered into the consideration of this subject: that, as to the central chimney, its action has been both proved and approved, and that all the central lights are ordered to be furnished with them; that as respects the application to separate and revolving lamps, the experiment has been made under the direction of the Trinity House, on a face of six lamps, being a full-sized copy of the Tynemouth revolving light, and, so far to the satisfaction of the Deputy Master and Brethren, that the plan is to be applied immediately to two light-houses which suffer most from condensation on the glass; he believes it will be with full success.

A LOCK-METER.

"*A model and drawing of a Lock-meter, used in Lombardy for measuring Water for Irrigation,*" were presented by Benedetto Albano, M. Inst. C. E.

The author stated that the necessity for regulating the supply of water for irrigation, had induced the adoption in Lombardy of a meter, with an aperture of given dimensions, as a standard for the emission of water to the irrigating channels—this was termed the "*Bocche Magistrale.*" This standard was called "*oncia d'acqua magistrale,*" by which was understood, a quantity of water flowing through a given aperture, under an unvarying pressure, permitting only the passage of a certain quantity per minute. This "*oncia d'acqua*" has now been ascertained by Krenzlin (Inspector General of Canals, Milan) to be equal to 2·12 cubic metres per minute, and is now the received authority; and the system is adopted through the Lombardian and Venetian Kingdoms, and other provinces of Italy. This quantity is supposing the flow to be through an aperture 3 *oncie*[3] wide by 4 high, and with a head of water of 2 *oncie*. An oncia is equal to 1·95 inches.

The structure consists of an aperture A, where the water is measured, nearly 8 inches high, 16 inches broad, and 6 inches long, leading to which is the channel C, 20 feet long, which has a floor inclined to the supplying stream B, at an angle of 1 in 15; this channel is covered by a horizontal close boarding or ceiling D, by which the undulatory motion of the water is checked and any air is prevented from getting into the channel, while the height of the head is restricted to 4 inches above the aperture A. At the end is a sluice-gate H, of the same width as the aperture A, to be raised by a rack I; on the gate is a block K, to prevent its being raised too high, and a bolt and lock secure it. The discharge channel F, is about 18 feet long, is inclined 1 in 108, and widens about 4 inches at each side, diverging outwards nearly 6 inches in the entire length. Care must be taken that the water in the channel at G, is always kept below the bed of the channel F. The sluice-gate being opened sufficiently to fill the covered channel up to the ceiling, the quantity of water flowing through the aperture is accurately measured. Just behind the sluice there is a small opening to see when the water has reached the proper level. The aperture A, to this metre will allow a discharge of 12·72 cubic metres, or 449 cubic feet, English measurement, per minute; beyond these proportions the aperture is not allowed to be increased, as there would be a sensible error in the quantity on account of the *vena contracta*.



"*On the Pressure and Density of Steam, with a proposed new formula for the relation between them; applicable particularly to Engines working with high-pressure Steam expansively.*" By William Pole, Assoc. Inst. C. E.

The relations between the elasticity, temperature, and density of steam have long been interesting and important subjects of philosophical research. The connexion of the two former, namely, pressure and temperature, with each other, has excited the greatest attention, numerous experiments having been undertaken to ascertain the values of them at all points of the scale, and many formulæ proposed by English and foreign mathematicians, to express approximately the relation between them.[3]

The pressure and temperature being known, the density, or what answers the same purpose, the relative volume, compared with the water which has produced it, may be deduced by a combination of the laws of Boyle[4] and Gay Lussac;[5] and may be expressed algebraically in terms of the pressure and temperature combined; whence, by eliminating the latter, by means of the before-mentioned formulæ, expressions can be arrived at which will connect at once the volume with the pressure.

But there are several difficulties in the way of this process, the equations which may be thus obtained being too complicated for practical use; and therefore, since it is important in calculations connected with steam and the steam-engine, to find a tolerably accurate, and at the same time, simple rule which shall give the pressure and volume directly in terms of each other, the empirical method has been resorted to.

The paper enumerates three formulæ given for this purpose by M. Navier and M. de Pambour, explaining the peculiar cases to which they are applicable, and those in which they fail; and the author then proposes a fourth expression, which is intended to meet a case not provided for by either of the others, namely, for "condensing engines working with high-pressure steam expansively;" such as the Cornish, and Woolf's double cylinder engine. The equation is—

$$P = \frac{24250}{V - 65},$$

$$\text{or reciprocally, } V = \frac{24250}{P} + 65.$$

P being the total pressure of the steam in lb. per square inch, and V its relative volume, compared with that of its constituent water.

These formulæ may be adopted without considerable error, throughout the range generally required in such engines, viz., from about 5 lb. to 65 lb. per square inch.

Two tables are then given showing the pressures and volumes as calcu

[3] Upwards of twenty different formulæ of this nature are given in the *Encyclopædia Britannica*, 7th edition, art. "Steam," where their respective merits and correspondence with the results of experiment, are amply investigated.

[4] That "if the temperature remain constant, the density varies directly as the pressure."

[5] That "if the pressure remain constant, and the temperature change, the volume receives a certain definite amount of augmentation, for each degree of temperature added, or *vice versâ*." This augmentation is equal ·00208 of the volume at freezing point, for each degree of Fahrenheit, or ·00375 for each degree Centigrade.

lated for every 5 lb. pressure in this scale; they show a comparison of the results of the four formulæ with each other, and the respective amount of deviation from truth in each.

The greatest error is—

	lb.	
By M. Navier's formula	1·31	per square inch.
M. de Pambour's first ditto ..	4·12	"
" " second ditto ..	2·75	"
The new formula	0·71	"

The mean error is—

	lb.	
By M. Navier's formula	0·245	per square inch.
M. de Pambour's first ditto ..	1·42	"
" " second ditto ..	0·35	"
The new formula	0·0062	"

The tables also show :—

1st. That the new formula is nearer the truth than either of the others taken separately, in three-fourths of the scale.

2nd. That it is nearer than all three combined, in half the scale.

3rd. That the greatest error of the new formula, with regard to the pressures, is only about half as great as that of the most correct of the other three.

4th. That the mean error is only one-fortieth of either of the others, and only equal to about one-tenth of an ounce per square inch.

5th. That the errors in the volumes are much less numerous and important with the new formula than with either of the others.

It is also added that the new expression is simpler in algebraical form than the others; it is more easily calculated, the constants are easier to remember, and that no alteration of the constants in the other formulæ will make them coincide so nearly with the truth as the new one does.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

Monday, November 4.—W. Tite, Esq. v.p., f.r.s. in the Chair.

He opened the proceedings of the session by making some observations in explanation of what he had stated at the concluding meeting of the last session. He alluded to what he had said as to the effect of the growing tendency to introduce Gothic architecture. What he intended to affirm was that it was not the duty of the architect to make a servile copy from the works of the ancients, but to avail himself of them only as exemplifications of the great principles which would require adaptation for modern edifices. In allusion to this subject he pointed out the advantage of studying the remains of the domestic architecture of the time of Edward III., as useful studies in the present day. So far from disapproving of the legitimate study of Gothic architecture he congratulated the members on the numerous restorations of ancient monuments in that style which were daily assuming all their ancient beauty. All he had wished to do was to caution junior members against the exclusive study of that style and the neglect of the classic monuments of Greece and Italy, which he considered to offer more suitable types for domestic edifices, and he reminded them of the excellent examples set them in this respect by Inigo Jones and Wren.

He then proceeded to give some account of his tour into Germany during the last summer, when he had an opportunity of viewing the Walhalla (described in our *Journal* for April and May last, and accompanied with a view of the exterior & interior). He stated that the building was well studied, its situation admirable, and the blending of architecture, sculpture and painting exquisite, while the colouring is not so elaborate or so glaring as to make the contrast too great. In passing through the town of Ulm in Wirtemburgh he visited the cathedral which he described as a very fine building, and well deserving the inspection of architects who may be travelling in Germany; although it is a Lutheran church, there are several objects well deserving of notice, it has four aisles with arches supporting a clerestory. The wood carving in the choir is extremely good. There is also a fine specimen of architecture, the tabernacle for the host, which is on the north side of the choir. In Munich he considered colouring was carried too far, the effect of colouring in external decoration not being good. For example the Theatre at Munich is a very fine building; it has a portico with a pediment, the tympanum of which is painted in fresco; at the back of this pediment is a second pediment also painted, the effect of which is extremely harsh. He then referred to the prevailing style of architecture in Munich, of which he said the two principal buildings were in the Byzantine style. The Basilica now being erected is in that style and well adapted to exhibit the effect of gilding. The library is in the Florentine style, but the external colouring is not well introduced. Mr. Tite then observed that from what he saw at Munich, and from the present tendency in England colour and decoration would be carried too far and likely to run into excess, although good in interiors the quantity of gold requires light, and consequently is not in some cases so well suited for ceilings. The roof of the Basilica is a queen-post roof and the interior is opened to the hall, the rafters are decorated as well as the other timbers, but the poverty of the materials is rather unfortunate as they are not well suited for decoration. The mode of building adopted in Munich has not the advantage we possess of the use of iron. Upon this point Mr. Tite advised the young architect to obtain a thorough knowledge, and learn the circumstances in which this metal might be advantageously introduced. In the course of the present session he promised to say something relative to the best form of beams, and as to the introduction of iron generally for architectural purposes.

Professor Donaldson then read a paper describing thirteen models of churches found in Henry the 5th, Chantry at Westminster Abbey, they were designs submitted to the Commissioners appointed in the reign of Queen Ann for building of forty churches in the metropolis, but only three out of the thirteen models had been erected, viz., the New Church, Strand, Greenwich Church, and St. James' Westminster; the others were designs of a high class, and he considered it a great loss to the architectural character of the metropolis that they were never carried into effect. The models are well executed and in good preservation, and it is to be regretted that they are not opened to public inspection.

Professor Donaldson also made some observations on the application of fresco by the old Italian masters to the exterior of buildings for decoration, and exhibited an original drawing by Poltidori in illustration. He then read a letter from Mr. Crace, of Wigmore Street, giving some account of the frescos which had fallen under his notice during a recent tour in Germany and the north of Italy. Mr. Crace observes "that in Italy, Switzerland, and the south of Germany, the paintings in fresco are so general, that there is scarcely a town in which, both in the exterior and in the interior of the houses, some are not to be met with. In Italy this kind of decoration is the most frequent; *there*, in many cases, the architectural effects seem to have been arranged, with the view of being afterwards aided by painting; the enrichments of the mouldings and the ornaments being given in chiaro oscuro. In other cases, again, the whole surface of the wall is covered with historical or allegorical and ornamental painting. My principal object in travelling was, firstly, to learn the processes employed in fresco and encaustic painting; secondly, to form an opinion as to the effects produced; and thirdly, to judge how far those effects would surpass painting in oil, in appearance and durability. For the two first reasons it was, therefore, the modern specimens of the art, to which my attention was principally directed. At the Royal Palace at Venice, I noticed decorations lately executed in fresco; but it was at Munich that I saw the art most extensively employed. In this city it is to be met with in every modern public building. In the church of St. Louis is the grand picture of the Last Judgment by Cornelius, and other frescos of considerable merit by his pupils. In the All Saints' Chapel (Aller Heilige Capelle) are some beautiful paintings by Hess and his pupils, on a gold ground. At the basilica of St. Bonifacius, so splendidly decorated, Hess and others are employed at this time on a series of grand paintings; at the Glyptothek are the frescos of Cornelius; at the Pynacothek, those by Zimmerman and others; and at the two Royal Palaces, each room is adorned by some artist of excellence, either in fresco or encaustic. In addition to these interiors there are examples of exterior decorations at the Hof Garden, the façade of the Post Office, and the Theatre. The process of painting in fresco, though attended with certain difficulties, is easily learnt with ordinary perseverance. The effects produced surpass painting in oil, in solidity and clearness; but owing to the limitation of colours employed, there always appeared to me a certain yellow brown dry effect, and a want of the richness of paintings in oil. In the grand fresco by Cornelius of the Last Judgment, I think this must be felt by all; and in the beautiful composition by Veith at Frankfort, this defect is still more apparent.

"The manual operation I found, to my surprise, to be by no means rapid, even by the practised hands. One of the most distinguished artists I noticed painting a broad fold in the drapery of a monk, he used a small brush, and gained his effects by repeated touches. The ground of lime and sand requires to be touched with delicacy. The pictures in execution at the Basilica, take, I was informed by one of the artists, nearly a twelve month to execute. The cartoons and pounces are prepared in the winter months, and the painting is done during the summer. In ornament too, I observed that the work was not quicker than in oil, and much slower than in distemper to which it is superior as bearing washing, but inferior in the brilliancy of colouring. As to the durability of fresco in the older examples that I noticed in Italy, though the paintings had preserved to a considerable extent their original colouring, yet the effect was in almost all cases impaired by the decay of the plaster ground, the surface of which had crumbled through the action of the atmosphere. At Venice where works on a grand scale have been executed in both fresco, and oil, I was curious to compare the relative defects and advantages of each, and found, that though the paintings in oil of some masters had much darkened, yet that with others, particularly Paul Veronese, the effects were still clean and fresh, and, upon the whole, being in better preservation, surpassed the actual appearance of most of the frescos. In the grand works lately executed at Munich they have been too recently done to allow of an opinion being formed, yet, in the exterior specimens at the post office, and the Hof Garden, signs of decay are very evident. Upon the whole, reflecting upon all I saw, considering the difficulties of execution, the liability of decay in the ground, and the impossibility of reparation if injured, I could not perceive any great advantages over oil; in this country must be further added the additional likelihood of decay, from our damp climate, and discolouration through smoke and fog; on the one side it has great advantages in being seen to perfection in all lights, and therefore particularly advantageous for paintings of architectural effects in its clearness, and the soundness of its colour; on the other side, the disadvantages I have enumerated above."

After the reading of Mr. Crace's paper some observations were made by the Vice President and other members on the effect of fresco. An anecdote was related respecting Cornelius that when the King of Bavaria was viewing his famous fresco of the Last Judgment, he observed to Cornelius that it appeared as if it were three centuries old, Cornelius replied, "That is just what I wanted." It was also observed that it was surprising what a golden effect was produced by simple colours, although done in dry and unshining materials. In Munich the bricks are well burnt notwithstanding they are absorbent, the lime is very good and a large quantity of it is used in proportion to sand. The bricks are laid with open joints, the plastering is first laid on with a hand float, afterwards the fine coat to take the fresco is laid on by the plasterer, who comes the first thing in the morning and puts on just sufficient for the artist to work upon during the same day, and which this latter must finish before it is dry. The difficulty in England will be to get rid of the efflorescence of saltpetre, which can be removed by repeated washing. The frescos by Aglio in Moorfields chapel appears to have failed on this account.

Mr. Arthur Johnson was presented with a prize consisting of the first volume of the Transactions of the Institute for the best sketches sent in by the pupils during the last session.

November 20, 1843.—W. Tite, Esq. v.p. in the Chair.

A highly interesting and practical paper on Timber and Deals was read' which is given in full in another part of the *Journal.*

Observations.—After the paper was read Mr. Tite observed that it was exactly applicable to the practical architect, it is quite useless for architects to introduce into their specifications the quality of materials to be used without they are able to ascertain that the contractor has complied with the stipulations of the contract. He adverted to the proper use of deals; nothing was so injurious or vexatious as the introduction of unseasoned deals, although they appear to be quite dry; this can only be avoided by a practical knowledge of the quality of timber and deals on the part of the architect. Respecting timber the trifling difference in the price of Baltic and pine timber was now so trifling that it was not worth while to introduce the latter, there is something in it which renders it liable to the dry rot.

In London there is scarcely any other deals introduced but what were named in the paper just read, but in other parts of England, and abroad, there were other materials used; at Liverpool the floor of the Custom House consists of narrow boards cut out of Riga timber which was stacked with great care for some years; it was laid in widths of five inches with sawn edges quite close, and afterwards planed. In France they knew of no deals, they used boards cut out of the best Memel timber in every variety of joiners' work. In Scotland yellow pine was used to a great extent in joiners' work without being painted, it is very durable if not covered up. At one of the meetings during the last session he stated that the Great Western rails were laid on yellow pine timbers, and that they had been taken up in consequence of the failure of the Kyanizing; he has since ascertained that that was not the case, for the timbers which had been Kyanized were found to be perfectly sound when taken up, and that the reason for removing them was to lay down sleepers of larger dimensions. He observed that in Switzerland, a country very much exposed to a moist climate, the growth of moss, &c., that the timbers were not painted, although very much exposed, notwithstanding that many were 150 to 200 years old it was very rare to see any symptom of decay. Silver pine is used; it may be seen growing in trees 160ft. to 170ft. and even from 200ft. to 230ft. high without a branch, 20in. girth, (? ¼ girth) none of it is converted for the European market. In France oak is felled in the autumn, and in no other time of the year, under a heavy penalty, but in England it is felled in the spring with the sap in it for the sake of the bark, consequently it is very liable to decay, and to be attacked with the dry rot, the sap being a pabulum for the latter; now that the price of bark was low, it is hardly worth the practice of felling it in the spring, considering the difference in the value, with that which is felled in the autumn.

Mr. Tite also made some observations on the introduction of large timbers in the construction of warehouse floors, formerly the joists were carried on girders of whole timber about 14 in. square laid from wall to wall on caps on top of posts, and he has known where a large knot happened to come near the bearings the timber to split up; he has seen the upper floor of warehouses which were heavily laden depressed full 15 in. which so compressed the vertical posts, and caused them to *eat* into the timber girders, that when the weight was removed the floors sprang up again and all the posts became quite loose, so much so that it was found necessary to drive a wedge under each post on every floor. He never used whole timber for girders but always forms them of two pieces of timber 14 in. deep by 9 in. or 10 in. reversed, and lays them on iron caps fitted on to the top of the posts or iron stancheons, and instead of the posts above standing on the girders, a dowel, or pin, is inserted between the two pieces of timber forming the girder, and between the head of the post below and the base of the columns above this discharging the weight vertically through the posts, by which means the girders have only to carry the weight of each separate floor.

A gentleman present observed that there was a great variety of timber used on the continent unknown to this country, he instanced the mountains of Switzerland which might supply us with fine timber; in one of the Cantons is a timber suitable for lining walls, wainscotting. &c., it is called "stone pine," it is of slow growth which ensures durability, it also has a peculiar fragrance. In Scotland a great deal of valuable timber (larch) has been planted by the Duke of Athol, which being free from duty might be advantageously introduced into England, he also stated that timber might be preserved from the attacks of dry rot by washing it over, particularly the ends, with *impure pyroligneous acid retaining the creosote*.

It was also noticed by a member that yellow pine was used almost exclusively in Glasgow, and a considerable portion in Liverpool and Manchester, at the latter place, Mr. Bellhouse, an extensive builder, has given the preference to yellow pine for many years[1].

Mr. Hiscock stated that two houses being built under his direction, at Stones' end in the Borough, the proprietor did not intend to use any paint for the joinery, but simply use varnish.

ON THE MODERN PRACTICE OF COMPETITION.

In our number for March, 1842, we gave a full report of Professor Hosking's Introductory Lecture, then lately delivered at King's College, on the Principles and Practice of Architecture. In this lecture Mr. Hosking took occasion to denounce the system of submitting designs in competition upon speculation, and he afterwards published his lecture in a separate form, and then added to it as an appendix, "Further remarks on the modern practice of competition." Late in the last session of the Royal Institute of British Architects, a special general meeting of the members was summoned to consider a resolution upon the same subject; but the attendance of members was so thin, that the subject was adjourned until the next session, some time in the present month being named for it. Although it does not appear in the circular with whom the proposed resolution originated, there seems to be no need for hesitation in attributing it to the author of the above-mentioned lecture and of the "Further Remarks;" and as the time is now approaching for the discussion, we have thought that we may perform a useful service in transferring some of Mr. Hosking's "Further Remarks" to our pages, to prepare the members of the Institute at large for the consideration of the subject by a knowledge of the reasons upon which the resolution has been founded.

The resolution is as follows:—"That the modern practice of submitting designs in competing speculations for premiums, or for employment, or in any competition for preference without specific or properly implied promise of certain payment to each and every competitor, operates injuriously upon architecture, and upon the interests and character of the profession."

"It is a most offensive feature of the modern gambling and degrading system of competition that all Architects are supposed to pursue the game, so that successful intriguers who do follow it, are supposed to be the only meritorious practitioners, at the expense of those who have never fallen from virtue, or who, having fallen, have seen their error, and repented. This feature of the system is not only offensive to those who see the folly and avoid

[1] Mr. John Miller, a ship-owner at Liverpool, largely engaged in the importation of timber from the colonies, stated in his evidence before the Parliamentary Committee in answer to some questions put to him regarding North American yellow pine timber:—"I know that Mr. Bellhouse, who is the largest dealer in Manchester, has changed the views he formerly entertained as to the comparative merits of the two timbers, and that he now gives a decided preference to the timber from the Colonies. For all purposes, he, in building large warehouses, has latterly consumed Canadian yellow pine in preference to Canadian red, or Dantzic, or Memel. He states, I think, that he consumes about fifty cargoes a year; and even when he can get lengths of Canadian red timber, or Memel timber to suit the purpose, he uses in preference Canada yellow pine, and he states his reason that, for the last fifteen years he has been a close observer of the different qualities of timber, and the different effects produced upon it by exposure to air and influence of atmosphere, and he finds that when the yellow pine of Canada is introduced into brick and mortar, the ends are little liable to decay, and that the ends either of the red pine timber from Canada, or of Memel and Dantzic timber, are more liable to decay. This opinion of Mr. Bellhouse is the result of long experience, and is a change from his former opinion. In Glasgow, where I know at first they used for building purposes nothing but Baltic timber, year (1835) I wrote to Glasgow to a correspondent of my own, a large dealer in timber, to give me a statement of the proportions of each sort in consumption there, and he told me that the whole consumption in Glasgow of Baltic timber last year was not 200 loads."

it, but it is injurious to the public. Most persons upon whom the duty devolves of procuring designs for intended buildings are imposed upon by a notion that, in advertising for anonymous designs, they secure the advantage of designs from men of character and matured judgment; but as few such ever respond to the call in ordinary cases, the great bulk of competition business falls into the hands of the intriguing jobbers, and the public and the profession are both cheated.

"Even in the case of the houses of Parliament, which has been thought by many to afford the fullest justification of the system of general or public competition, because of its apparent successful result, the public possibly suffered irremediable injury. The principal public works of the preceding twenty or thirty years had been committed absolutely to a few practitioners, who ought, therefore, to be supposed the most competent, or at least, among the most competent, Architects the country afforded. It might be readily determined that such men would not enter into the sort of competition that was established; and so it happened that they did not; and the nation lost the application of the knowledge, experience, and taste of those who were, or who ought to have been, the best qualified, when seeking designs for one of the most important public worksthat a nation can have to devise. Either this was a great advantage lost, or the nation had been greatly wronged for a long series of years by the committal of its public works to men whose loss in such a case was no disadvantage? But it may be confidently assumed that, if the successful candidate in the competition that took place for the Houses of Parliament had been established in practice and reputation at the time of the competition as he must find himself now, no design would have been forthcoming from him. The successful competitor for the Houses of Parliament sent no design for the Royal Exchange, and surely the talent of the Architect, to whom pre-eminence had been so universally accorded in the case of the Palace of the Legislature ought to have been secured in procuring a choice of designs for the Forum of Commerce.

"It must be remembered, nevertheless, that the all-important limitation of cost was not imposed upon the Houses of Parliament Designs—and the source of much of the difficulty in ordinary cases did not therefore exist. With the Royal Exehange this difficulty presented itself, and, in an endeavour to act justly, the grossest injustice was done; the viciousness of the system prevailing against an apparently sincere desire to do well, until, at length, the matter was decided in a contest of interest between two Architects, neither of whom was understood to have taken part in the public *Competition*, and if either had done so, his design had been passed over in the original selection as of inferior merit! * * *

"The present writer has already pointed out in the foregoing Lecture the only efficient remedy, as he believes, for the abuses of the existing system of competition; and it is in the hands of the profession to adopt it and leave the public to seek its remedy. The "profession" cannot, of course, compel but by the example of individual members of it acting upon all, and by making it evident that every man must be himself the example who would bear an honourable standing among his fellows. * *

"The public ought to understand, however, that what is generally required in a competition *cannot* be fully and honestly complied with by either party. It is one thing to make a design for a building of the kind and capacity required—it is another thing to arrange such design in detail, that the cost of executing it may be accurately estimated—it is still another thing to specify particularly all the materials, and their various kinds, qualities, and capacities, the operations to which the materials shall be subjected, and the quantity and quality of the labour or workmanship that shall be bestowed upon them respectively—and it is still a further operation to estimate from the detailed drawings and particularized specifications what the cost of the building must be. All these things should be done, nevertheless, and by every competitor, when the cost is a condition; and, moreover, every design so elaborated should be fully investigated in all its details, or the conditions of the competition are not fulfilled by the parties imposing them. Now, conscientious men, having entered upon a competition, are compelled to limit the extent and appearance of their design to the means set forth in the "conditions," and to satisfy their own minds that it can be carried out as the parties requiring it expect, within those means. The most conscientious, however, cannot do all that ought to be done to make the conditions complete—*cannot*, because of the immense disproportion between the labour and expense which such fulfilment would involve, and the probability that the labour and expense so applied will not be of the slightest value. But the practice has been, and is, and it always will be, with bodies of men, be they small or large, committees, or the public in general, to look at externals—at the mere outside; and they are influenced by the effect produced in or by the prettiness of the drawings or models in which the design presents itself; the merits or demerits of the "plan," as architects understand the term—the kinds and qualities of materials and workmanship—the extent of enrichment in detail—and the thousand other things that go to affect the merit of a design and its compliance or non-compliance with the "conditions," are neither attended to nor understood; the effect of the design as to its decorative disposition is the utmost that they perceive, and the decision takes place accordingly. Hence it is that the conscientious man must always be an unsuccessful public competitor when cost is a condition. Even in the notorious case of the Royal Exchange, which might appear to contradict this, the reputedly successful conscientious competitor was still, for any value attachable to success, unsuccessful. * * *

"In truth, the public or their committees ask for *too much*, having reference to what they *really want*. Let the requirement be confined to a general design of a building of the particular kind required—of certain capacity—and adapted to a particular site—and to be built of certain main constituent materials.—Stipulate for a particular scale, and that the designs shall be presented in drawings—in outline, or tinted—and of what particular tint or tints alone—and, if perspective views are desired—fix the point or points of view. More will not then be required than most Architects would be willing to engage themselves upon a comparatively small fee, giving the public thereby the advantage of Competition, as far as it can be made of any use, without involving the great expense that elaborated designs must occasion. The one, two, and three hundred pound premiums, now held out to gambling crowds, might then be divided into twenty, thirty, forty, or fifty guinea fees, according to the circumstances of the case, and offered to such practitioners as might be known, or whose latent "talent," committees, or individual members of committes, might desire to draw out or encourage; and as no man educated to a liberal profession is without some connexions to whom it will happen to be able to give a helping hand, by nominating him, or procuring him to be nominated, upon one such Competition or other, all "talent" *connected with knowledge and supported by character* might emerge from the greatest obscurity in which it is to be found *so associated*. The successful competitor under such circumstances might be trusted to carry out his design in detail, adapting it to all the circumstances of the case much better than he could have done in a general Competition.

"In an endeavour to convince Architects, as a PROFESSION, in what their true interest consists, it is, perhaps, but proper to have pointed out to the public than the present system of Competition represses the honourable candidate for repntation and employment, by rendering it impossible for him to compete on equal terms with the uncrupulous, and that, consequently, the public are thrown into the hands of the latter; and to have pointed out also, that there is a reasonable course that may be pursued by which all the advantages of Competition are to be obtained, although Architects refuse any longer to lend themselves to gambling speculations.

The public will, nevertheless, go on as they have gone on until Architects, as a PROFESSION, shall have declined any longer to degrade and beggar themselves. It is, therefore, not a question proposed to the public,—and it is one indeed with which the public have nothing to do, beyond the interest which the public have in raising the character of the PROFESSION of Architecture, but which they will never recognise while they think they benefit by its debasement. *It is a matter to be determined by the Architects themselves;* and it may, perhaps, be hoped that this exposition of the abuse the PROFESSION labour under will induce all who are not quite besotted with the vice to consider the question in this, its true point of view; and, having so considered it, there can be, it may be further hoped, no doubt that all those who have any sense of HONOUR and VIRTUE, or, indeed any SELF-RESPECT, remaining, will no longer lend themselves to the present degrading system, and it will soon cease to exist among us.

October, 1842.

REVIEWS.

Penny Cyclopædia. Art. "WINDOW."

The part of this excellent Cyclopædia, which will be published on the same day as this number of our own *Journal*, is, we believe, the final one, and thus a very arduous undertaking will have been successfully accomplished, after being carried on for eleven years, not only with the same diligence as at first, but, if anything, with an increased degree of it. We have, indeed, seen querulous and even reproachful observations as to the extent to which the work was being carried on; but we think all—even the most impatient, must now rejoice that it was not brought to a close within the number of volumes originally contemplated, and which it has exceeded by three. Had there been any kind of stoppages, or want of punctuality, there would have been some grounds for complaint, and there might have been great uncertainty as to when it would be finished, yet it has invariably been brought out regularly from its first commencement, which is much more than can be said for every other work of the kind. Others, too, there are, which have been hurried on towards their close that they may be said to have been finished without being completed, the articles in the later letters of the alphabet bearing no sort of proportion to those in the earlier ones; and such has been the case in regard to two architectural dictionaries.

Fortunately it is quite the reverse with this Cyclopædia, since the two last volumes contain several articles which, interesting as they are in themselves, might have been omitted, as the omission could have been neither detected nor complained of. Among them are several additions to architectural biography, including the names of *Voronikhim*, *Weinbrenner*, *Wiebeking*, *Wilkins*, and *Wood* of Bath, the last of whom has found no place in any English biographical work—at least none of the many we have referred to for it—although he has been dead these eighty years; nor can it be alleged that he was too obscure in his profession for notice, since the man who made nearly an entire city his own monument, deserves to be recorded quite as much as the illustrious Nash—we do not mean the architect, but the "beau."

"*Walhalla*"—the so-called structure near Reginsburg, which is here fully described, is also an article which it was not absolutely indispensable to give, and the same may be said of "*Windsor Castle*," yet articles of this class are a very great improvement upon what was done at first. We shall confine ourselves, however, for extracts, to the article "Window," although it is one that ought to be read entire.

"It is one very great advantage of the Gothic or Pointed style, that there the windows derive strong architectural expression from the apertures themselves; which, with the mullions, transoms, and tracery inserted in them, mainly form the design and decoration; while the external mouldings and ornaments contribute to them only in a subordinate degree. Consequently, if others quite plain, the windows can never appear mere vacant spaces. Widely different is it in those styles where the ornamental design is confined to the mere exterior or framing of the aperture: therefore, however they may be so decorated, the openings will, if of very large dimensions, always have a vacant look, and the glazing of the windows will appear to be in want of adequate support. Such is the case with the windows of St. Paul's, where the apertures are filled in only with very ordinary glazing in small panes, and consequently are so far from being pleasing, as to produce a sombre, dingy appearance; whereas in Gothic windows the glazing shows itself to be firmly supported by the mullion, and is never extended over such large unbroken surfaces, let the size of the window be what it may, as to produce an effect of blankness. It is another advantage peculiar to that style that it allows windows to be of any dimensions—of the smallest as well as the largest, and windows of very different sizes and proportions to be introduced into the same elevation. For further remarks on this subject the reader may refer to what has been said on Gothic Architecture, p. 324, and Oriel; since we must here confine ourselves to windows in the Italian or modern style generally."

After speaking of the various modes of treating windows according to the floor they occupy in a façade, the writer proceeds with remarks of his own, referring to various examples.

"In the basement of the Strand front of Somerset House, which, although secondary to the order, is almost of equal importance and effect in the general composition, the windows are more than usually decorated, having Doric pilasters, entablatures, and pediments, and their sills resting upon bold consoles or trusses. It is true they are set within arcades, and therefore preparation is so far made for their dressings, which are thus framed in from the rusticated surface, so that their richness does not seem at variance with the latter; the richness itself too is of a bold character. When the ground-floor is not a distinct basement, its windows require to be equally dressed, or very nearly so, with those of the principal floor, with little other difference as to proportion and design than what is necessary for preserving some distinction and avoiding monotonous repetition; because, though it is desirable that all the windows on a floor should be of uniform design, except that a centre window may occasionally be more decorated and rendered a more conspicuous feature than the rest, it is hardly less desirable to avoid the sameness arising from all the windows of a front being too nearly alike. Where the ground-floor is the principal one also, as is now frequently the case in villa residences, in which all the chief rooms are below, and perhaps only a single chamber-floor over them, the lower windows are of course the most important in design; yet, whether the principal or secondary, they ought to be in keeping with the rest of the design. This rule, or rather this law of æsthetic composition, has been admirably well attended to by Mr. Barry in the Travellers' and Reform Clubhouses, London, and, on the contrary, violated in the exterior of Goldsmiths' Hall, where, although there are two ranges of windows included within the same order, and the upper windows are decorated in an unusual degree, almost to excess, those below have no dressings, not even any kind of rusticated borders in lieu of them, but are merely so many plain apertures on a surface scantily streaked with horizontal rustic joints. Accordingly, while the lower division of the front looks poor, and is deficient in boldness, the upper windows seem overloaded with ornament.

"What has been said in regard to the sequence of the different tiers of windows in an elevation, is to be understood only generally, there being many exceptions, and not a few anomalous cases. In the façade of the Palazzo Massimi at Rome, one of Peruzzi's best works, there are two tiers of mezzanine windows above those of the principal floor; in the celebrated Palazzo Farnese, on the contrary, the second-floor windows (which are also the uppermost) are somewhat loftier than the others, at least in their apertures, owing to these last being arched, and are further remarkable as having pediments, which are seldom used for windows higher up than the first-floor. In Sangello's façade of the Palazzo Sachetti, there is a range of mezzanines between the windows of the first and the uppermost floor, and instead of being made principal in the design, the former are considerably less than those of the ground-floor, and are moreover singular as being *Atticurg*—a term applied by some to those doors and windows which are narrower at top than at bottom, as in the Erechtheum. [DOOR, p. 86.] The façade of the Palazzo Negroni, by Ammanati, is similar in its general character to the preceding, there being a row of mezzanine and square windows between the first and third floor; and it also resembles it in the importance given to the ground-floor windows. In regard to windows of the last-mentioned class, the Palazzo Buoncompagno at Rome, a work attributed to Bramante, offers an unusual example, for there the lower floor and its windows are made the next principal features after those immediately above them: in both the apertures themselves are round-headed, with imposts and archivolts, but flanked by pilasters supporting an entablature, whereby the general form of the *chambranle*, or dressing, becomes square-headed: the chief difference between these two tiers of windows is, that those above have pediments (alternately angular and segmental), while the others have none."

That the writer in the Cyclopædia has not the same horror of small "gables" over windows as Dr. Fulton has, is evident from the following remarks, with which we must close our extracts.

"In addition to the above, there are many other parts which enter into the composition of window-dressings, and among them a principal one is the *pediment*, applied by way of finish to the whole. Some critics have urged objections against pediments to windows, as being contrary to strict propriety: hypercriticism of that kind might be directed against a great deal in every style, on which its particular character and expression more or less depend. It is enough for us that the application of the pediment form to such purpose is so fully established that no idea of incongruity attends it, and that, considered with regard to its artistical effect, it contributes to variety in various ways. At the same time we cannot admit as legitimate more than two distinct varieties of it, namely, the *angular*, and the curved or *segmental*; for as soon as we begin to disturb the outline, we violate the principles of the style from which such decorative feature is derived. Broken pediments, scrolled-shaped ones, &c. are therefore to be put into the same category with twisted columns and other extravagances of that kind, which, so far from displaying invention, rather betray sterility of ideas, and the inability to attain originality otherwise than by adopting what the least educated taste rejects as vicious. Even segmental pediments ought to be very sparingly introduced—perhaps only for the sake of variety, in alternation with angular ones, they being in themselves rather heavy in appearance. One great value of the pediment as a decorative feature of windows is, that its sloping lines contrast with those of horizontal mouldings, and occasion variety of outline in the general form of windows; and that such addition serves to distinguish and give due importance to the windows of the principal floor of a building, to which, in good composition, they are generally confined. In the Palazzo Farnese both the upper rows of windows have pediments; the first alternately angular and segmental, the other only angular ones; and there, owing to the very great space over the windows, the numerous pediments do not seem to overload the design, as would be the case if the upper ones were to come nearly immediately beneath the superior cornice. * * *

"We now come to another mode, quite distinct from any of the preceding, namely, that which consists in applying a small order either in columns or pilasters, with a regular entablature, sometimes with the usual architrave also surrounding the aperture of the window, at others not. And though some object to such *mycrostyle* compositions, as being inconsistent with the original purpose of columns, their impropriety is at least redeemed by richness and beauty. At all events, the impropriety is not so great as that of applying small orders successively to the different stories of a building, thereby rendering diminutive, parts which, if introduced, ought to be proportioned to the entire edifice; whereas, in the case of columns to windows, they show themselves to be intended only as decorations, and though really small, yet being distinct and independent features, instead of giving an air of littleness to the entire composition, they rather give greater dignity and importance to the windows. As to the actual effect produced by them, that depends upon the judgment and taste with which such decoration is applied. Windows of this kind are certainly not suited for any except astylar composition, since if there be also a large general order to the façade, while the columns to the windows look rather insignificant by comparison, there is too much of repetition and monotony, and the whole decoration seems to consist only of columns of different sizes. Still worse is the effect when, as is the case with the Atlas Office, Cheapside, London, the building consists of more than one order, because then, as the windows must be large in proportion to those orders, the columns to the windows cause the others to look petty, and the whole to appear both crowded and confused—a defect most strikingly exemplified in the structure alluded to, nor is it at all decreased by the windows to both the upper floors being columniated. On the contrary, Barry's two clubhouses in Pall-Mall are truly beautiful examples in regard to windows thus decorated; for there they are treated in a most masterly manner, and applied with the happiest effect, and so as to produce a felicitous union of sobriety and simplicity with a very high degree of decoration. Instead of being mere copies, those windows are original and admirably studied compositions, beautifully and even elaborately finished, whereas in the other instance just mentioned, and also in the front of the Clubhouse Chambers, Regent Street, though there are columns to the windows, there is a very sorry entablature to them—neither architrave nor frieze, but meerly a plain lintel in lieu of them, without mouldings of any kind, which, besides being offensively lumpish and heavy, look mean in what professes to be decoration of a superior kind."

The article ought to have been more fully illustrated with cuts, and no doubt would have been so, had the writer of it not been at all controlled in that respect.

Glenny's Garden Almanac for 1844. London: R. Groombridge

The Gardener or the Amateur will find much useful information relative to the cultivation of the flower and kitchen garden in this almanac.

The Mechanic's Almanac and Engineer's Year-book for 1844. Published by the Stationers' Company, contains a great variety of statiscal and scientific information, collated from various works of the present year.

A Cosmoramic View of London. Engraved by J. H. Banks.

This is a novel, and at the same time, an interesting view of the great metropolis, it not only shows the line of streets, squares, &c., but also the elevation of the houses, bridges, and all the public buildings; it is a work of great labour and deserves encouragement.

Polygraphia Curiosa.—Mr. Jobbins, the lithographer, is collecting together the various alphabets of writers of by-gone days; many of them are of a beautiful form and in colours; he intends to publish them in parts, two of which have already appeared; it will be a work of considerable interest, and deserving of support, particularly by the architect.

Davies' Reconnoitering Telescopes are very compact, being only $3\frac{1}{2}$ inches long, an inch diameter, and of great power; they are particularly convenient to carry in the pocket on a ramble or tour.

RAILWAY CHRONICLE OF THE MONTH.

Amalgamation is still the great topic of the day. We closed the last month by announcing the conclusion of the arrangement between the Eastern Counties and Northern and Eastern railways. Since then meetings have been held of the North Union and Bolton and Preston for a similar object. The terms are, that the North Union shall have twice as much per cent upon the amount of their capital as the Bolton and Preston have on theirs, until the dividends to the North Union reach 6 per cent, and the Bolton and Preston 3 per cent, then the remaining profits to be divided equally. The subscribed capital of the North Union is to be taken at £477,539, and of the Bolton and Preston £262,002, the total £730,541. The asserted intention of amalgamation between the Grand Junction, Liverpool and Manchester, and Manchester and Birmingham, is now formally denied. With regard to the Hull and Selby, however, feelers are being put out by Mr. Hudson, and he will no doubt succeed, as he holds out a prospect of 6 per cent. The Newcastle and Darlington have, we may observe, purchased the Durham Junction.

It is again stated that the Birmingham and Glo'ster have offered to sell the Glo'ster end of their line to the Great Western, but nothing certain can be depended on, as to the probability of such a transaction being immediately entered into.

Branch lines and new lines form another leading topic, particularly as the last day for giving notices of applications to Parliament is just past. We will briefly enumerate some of those as to which active measures are in progress. A branch from the South Eastern to Canterbury, Ramsgate and Margate, to be laid with a single line, cost about £300,000. This will be carried into effect. Another branch, the Hastings, Rye, and Tenterden Railway is started by an independent company, but as the parties are quarrelling among themselves and are not strongly backed, nothing is likely to be done. An opposition branch from the Brighton Railway to Hastings has been surveyed; but it is a mere campaigning movement. A line to Salisbury is talked of, and a number of local meetings have been held, but little is known as to the prospects of the project. The Great Western district is principally interested in the Devon and Cornwall line, which has been progressing favourably, but the definitive arrangements have not yet been made. The Great Western company have given notices for a branch to Newbury, and extensions into the railroads of Cheltenham and Glo'ster, showing their intention to consolidate their interest in that direction. The Holyhead line is moving, but is in a precarious state. The Manchester and Birmingham have made the arrangements for the branch to Macclesfield, whether, however, they will take steps as to a southern extension does not yet appear. A mineral line in Furness is well supported, and perhaps a continuation of the Maryport and Carlisle Railway to Whitehaven may be expected. A line is talked of to Blackburn. The £100,000 required from the local interest for the Lancaster, Kendal and Carlisle Railway, has been subscribed, and the other £400,000 will consequently be supplied by the Great Southern companies, and the scheme be prosecuted. A branch in Scotland, from the Edinburgh and Glasgow Railway to Stirling, has been asked for, but its prosecution is by no means certain. The only other proposed lines of interest in Scotland are the continuation of the Edinburgh, Leith, and Newhaven Railway to Granton Pier, and the formation of the line from Edinburgh to Newcastle, called the North British. The completion of these is also matter of uncertainty. A junction between the Newcastle and Darlington and Brandling junction will be carried out. The York and North Midland propose branches to Harrowgate, and to join the Whitby and Pickering. In south Yorkshire and Lancashire, however, the greatest vigour prevails, branches being proposed from the Manchester and Leeds, Sheffield and Manchester Railways to Ashton, Huddersfield, Chesterfield, and numerous other places.

In the eastern districts a line is proposed from Blackwall to Tilbury, being a resuscitation of the Thames Haven; but the other lines proposed depend upon the ultimate arrangements of the new Eastern Counties amalgamations. Such is the case with the Eastern Union, Harwich, Norwich and Brandon, &c.

A very curious meeting took place at Sunderland of the Durham and Sunderland company, which was for the purpose of removing a gentleman from the directors, whose proceedings very closely resembled those of a man *non compos*. The resolutions were carried unanimously.

The Bricklayers Arms branch is going on with rapidity, and will, it is expected, be ready by the Spring.

The Maidstone branch is announced to be ready by September of next year.

The South-Eastern half-yearly meeting took place on the 15th. All the works were declared to be getting on well, and all contractors accounts settled up, a fact which does great credit to Mr. William Cubitt. The traffic had got on well, but it was considered premature to declare a dividend. The Brighton accounts are still unsettled, they were said not to be satisfactory, and the Directors of the South-Eastern Railway showed no disposition to settle without some beneficial arrangement being made for their company.

THE AMSTERDAM AND ARNHEIM RAILWAY.

RHYN SPOORWEG.

The *Journal des Chemin de Fer* contains an account of this line, of which we have availed ourselves to give the following particulars. This railway proceeds from Amsterdam to Arnheim by Utrecht, and is in communication with the Amsterdam and Rotterdam Railway. It is intended to be put in connexion with the Prussian Railway. It is in an advanced state, an experimental trip has been made on 8 miles of it, and it is intended to open for traffic towards the end of the year, a section $22\frac{1}{2}$ miles long between Amsterdam and Utrecht. In the course of next year it is expected that the whole of the line to Arnheim will be completed, being a distance of 56 miles. The line is laid out with very good gradients, without any violent curves. The maximum inclination is 1 in 300. The distance between Amsterdam and Utrecht is laid out in three lines only, united by curves of about 270 yards radius, and some minor curves on approaching the Utrecht station. The soil through which the line passes is generally a thin stratum of mould of about a foot thick, under which is a kind of light turf. Sand for forming the embankments had to be got from a distance of some leagues from the dunes or sand-hills. The embankments vary from a yard to 4 yards in height, and are carried down to the natural soil of the polders or marshes. In the parts which are least solid, being a distance of 6 miles, the embankment, entirely of sand, rests on a bed of fascines 11 yards wide, and about 2 feet thick Notwithstanding this precaution many slips took place. This want of consistency or firmness, of the ground is indeed one principal reason why the original engineer Mynheer D. H. Goudridan, adopted a gauge of 2 metres (6ft. 6½in.) with rails of 25 to 30 kilogrammes per metre run (about 60 lbs. per yard), supported on a continuous framing of Baltic pine, of which the longitudinals are from 7 to 12 inches square, and the cross-sleepers placed a yard apart are from 6 in. to 12 in. square, with a length of 3 metres (about 3 yards). For the same reason this system has also been adopted on the Amsterdam and Rotterdam railway, However extensive this framing may be, it was necessary to use it to obtain a firm way for heavy trains. The country being a level there are no sensible slopes, but as the canals (large and small) frequently intersect, the engineers have been obliged to form a number of bridges and aqueducts, among which are three large swivel bridges of cast iron made at the Hague and two draw-bridges. The others are fixed wooden bridges, with abutments in masonry (? brick). All these works of art, as well as the Amsterdam stations, are built on piles. From Utrecht to Arnheim the road goes through a rougher country, and passes several heaths, requiring cuttings, of which five or six have a depth of from 30 to 65 ft., sometimes extending over a length of 300 yards. The total quantity of cutting is about 3,000,000 cubic yards, which has to be carried a mean distance of about two miles.. In general the cuttings are in mere sand mixed with loose pebbles. The inclination of the slopes, 36 to 50 feet high, is 45 degrees, and they are covered with heath sod (? grass sod). After standing two years it has been found that the rains have not at all affected the embankments. Between Utrecht and Arnheim the road is laid out with much the same kinds of curves and straight lengths as in the previous part, and among the works are a large cast iron swivel bridge, broad enough to carry two lines of rails, some smaller bridges in cast iron, and a number of occupation bridges, viaducts and culverts.

The act for this company was granted in 1838, and the capital was raised under the personal guarrantee of 4½ per cent. by the ex King Wm. 1st., he dividing with the shareholders the surplus profits. The direction of the works was entrusted to the government engineers, who, on account of the state of the law, had great difficulty in getting possession of the land, and settling with the landowners. Their difficulties were such that towards the end of 1842, they were still at law with a great number of them, and unable to prosecute the works with efficiency. Indeed, it was not till last Spring that all the landowners were pacified—then the works were proceeded with at a rate almost unprecedented in foreign engineering enterprises, under the guidance of the present engineer, M. Vanderkun. The estimate for the whole line, 60 miles long, £810,240, and it is not expected that the excess expenditure will be more than 3 or 4 thousand. The line is, for the most part, laid out for a single way—a double way being laid only on 6 miles between Amsterdam and Utrecht, and 6 miles between Utrecht and Arnheim. Sidings are, of course, provided at the several stations. All the bridges, and other works of art, are laid out for a double line, which will be laid down throughout where the extent of the traffic may require it.

The working plan consists, at present, of 6 locomotives, made by Sharp and Roberts, of Manchester, and 4 made at Amsterdam. They are all six-wheelers, with driving wheels of 6 ft. 6 in. Six locomotives on Robert Stephenson's new patent have also been ordered of Messrs. Van Vlissengen and Co., of Amsterdam. The number of passenger carriages and goods trains is now seventy, and will be next year one hundred and forty; they have been manufactured in the neighbourhood of Utrecht, and are all six wheels with flanges. All the engineers are Dutchmen.

NEW INVENTIONS AND IMPROVEMENTS.

NAPIER'S PATENT COPPER CLOTH.

A new material under the above name has lately been brought under our notice, which, as it promises to be, ere long, in very general and extensive use, we propose giving some account of it to our readers. It consists of stout linen cloth, on one side of which has been deposited, by electricity, a thin covering of copper, fibres from which, interlacing with those of the cloth, bind the whole firmly into one mass. The minute quantity of metal requisite to form a perfectly covered water-tight texture may be judged from this fact, that a square yard when perfect, weighs only 18 ounces; the cloth itself weighs 6 ounces, consequently 12 ounces of copper is sufficient to coat thoroughly a square yard of cloth; whilst the thinnest rolled copper at present in use weighs about 4½ lb. per square yard. The thickness of the metal, however, may be varied at pleasure, according to the purpose for which it is required. This production is the result of another beautiful application of electro-metallurgy—an art which, no sooner had it issued from the hands of the man of science as a mere experiment, than it stepped with giant strides into our arts and manufactures, and is now extending and ramifying itself in all directions, at one time gilding a pin, at another coppering a ship's bottom, or multiplying indefinately the delicate lines of the engraver.

The mode of manufacturing the copper cloth is as follows: on to a sheet of copper paste, very evenly, with as little paste as possible, stout linen cloth; and when thoroughly dry, attach it to the negative pole of a galvanic battery, and immerse it in a solution of sulphate of copper connecting a piece of copper to the positive pole to be dissolved. Decomposition takes place, copper is thrown down on the cloth, and, endeavouring to reach the copper plate, insinuates itself into all the pores of the cloth, forming one perfect whole. The time requisite will vary according to the thickness required, but in general five or six hours is quite sufficient to give a good coating. But a battery is by no means essential, as, by the following means, it may be dispensed with. Attach the copper, with the cloth pasted on it, to a sheet of amalgamated zinc, round which has been wrapped a stout piece of brown paper, with the ends sealed down, so as to form a kind of bag: immerse the whole into the solution, and a deposit immediately takes place, zinc being dissolved, and a nearly equal weight of copper deposited. This is a very cheap and simple method, and is well worthy the attention of the electrotypist. The sulphate of zinc formed remains within the paper bag, and very little of the copper solution finds its way into it. If the copper does not spread fast enough on the cloth, it may be rendered a better conductor of electricity by rubbing it over with a little blacklead, or what is better, a new conducting material, produced by heating pieces of zinc and iron together, to a heat a little below that at which the zinc sublimes; a crystalline compound is formed, which can be reduced to a very fine powder, and may be used either alone or with blacklead; when alone, it should be used with something adhesive; glycerine has been found to answer perfectly.

The process is not confined to covering the surface all over, as, by cutting the underneath copper into various shapes, devices of any kind may be struck into the cloth, which, being afterwards silvered or gilt, produces a very beautiful effect.

The numerous applications of this useful material will suggest themselves to the reader, not only for out-door works, such as for covering roofs, verandahs, &c., on account of its lightness and water-tightness, but also for ornamental purposes within doors; and we feel sure that it has but to be well-known to be very generally adopted.

NEW LIGHT.

It is now four years since the first experiment on the subject of rendering continuous, and fixing at a given point, the electric fluid, and making it applicable to the general purposes of lighting was made in Paris, but the discoverer was not able to induce any person to advance even 1,000f. for an apparatus on a sufficiently large scale for a public experiment. A public experiment was made at the Place de la Concorde, in the presence of the authorities, and from four to five thousand of the inhabitants of Paris, on the 20th inst. On one of the bases of the statues at the Pavilion de Lille, a glass globe of apparently twelve or thirteen inches diameter, with a moveable reflector, was fixed in connexion with a voltaic battery, and at a little before nine o'clock the electric fluid was thrown into it by a conductor. At this time all the gas lights in the place, about 100 in number, were burning. As soon as the electric light appeared, the nearest gas light had the same dull, thick, and heavy appearance as oil lamps have by the side of gas. Soon afterwards the gas lights were extinguished, and the electric light shone forth in all its brilliancy. Within 100 yards of the light it was easy to read the smallest print; it was, in fact, as light as day. The astonishment of the assembled multitude was very great, and their delight as strong as their astonishment. The estimate made by scientific persons who were present, was that the electric light was equal to twenty of the gas lamps, and, consequently, that five of these lights would suffice to light the whole place most brilliantly. As regards the expense of production, nothing positive has transpired, but it would be considerably less than that of the generation of gas, whilst the first outlay for machinery and conductors would not amount to a twentieth part of that required for gas-works. There would also be another great advantage in the electric light. It gives out no bad smell; it emits none of those elements which, in the burning of gas, are so injurious to health, and explosion would be impossible. The only danger would be at the battery itself, but that would be under the control of competent persons; and, even in this respect, there would be no danger, even to unskilful persons, with an apparatus of moderate size. Internal lighting would be as practicable as external lighting, for by conductors the fluid would be conveyed to every part of the house. This experiment was with a voltaic battery of two hundred pairs, composed as follows:—1st, an outer globe of glass; 2ndly, in this globe a cylinder of charcoal, open at both ends, and plunged in the nitric acid contained in the outer globe; 3rdly, in the charcoal a porous porcelain vase, containing acidulated water (with sulphuric acid)—this replaces the cloth in the common battery; 4thly, in the porcelain vase a cylinder of amalgam of zinc plunged in acidulated water. The pile was on the Pavilion de Lille; the two copper conductors from the two poles, and pointed with charcoal, lead to an empty globe from which the air has been exhausted. The two fluids on meeting produce a soft but most intense light. The experiment was considered highly successful by the authorities who were present, and it is to be repeated on a larger scale. Should the thing work as well as in a general way as it did last night, and the cost be less than that of gas, which it must be, there will be a dreadful revolution in gas works. A company for supplying the electric light would realize a handsome profit on charging only a sixth of what is now paid for gas. The strength of the electric light did not appear to exceed that of the hydro-oxygen; but then how much more simple is the apparatus; how much less costly the expense of production! The hydro-oxygen light requires a double and most expensive apparatus, and is only applicable to a few localities; the electric light may be applied externally and internally in any place.

[The above description, copied from the French Journals, has been inserted by many English papers, without comment, like several other paragraphs of *new* and *wonderful* inventions, which, if we are to believe them, are to supersede the present arrangements; and yet, from that time forward, we never hear anything more of them, they having been proved to be either perfectly impracticable, or, as is our opinion in the present instance, far more expensive than that which is already in use; conclusions to which every reader could arrive at once, if the whole of the evidence were given instead of only that portion which just suits the inventor or projector to give. Although we consider that the consumption of nitric and sulphuric acids and zinc, in 200 cells of a battery, would cost much more than the gas requisite for the 20 lights which it is said to be equal to, we cannot state so for certain without more data. But what we find most fault with is, the stating that to be new, which has no novelty about it, and which every tyro in galvanism has himself performed. The battery is an ordinary Grove's arrangement, with charcoal substituted for the platinum, an improvement which was made immediately after Grove's first announcement, and of which the younger Silliman has long ago published a very simple arrangement. The *new* light produced thereby between the charcoal poles, is almost as old as the science itself, and is described in every treatise on the subject. Besides which, in connexion with a cheaper battery, the whole process has been patented in this country with much better arrangements, and has not been carried out, we suspect, on account, of the increased expense over gas. As to the bad smell being given off, there certainly is not at the light itself, but at the proposed battery there are nitric acid fumes given off, which are not only offensive, but highly corrosive to anything it comes near, animal, vegetable, and mineral. It would be requisite to keep it in a place by itself, if used in houses, as proposed, and then comes the increased resistance to the current produced by length of conducting wires. Although well-disposed to encourage any plausible scheme for improving or cheapening public lighting, we cannot, in the present instance, see much to give us hopes of its success. At all events, we wish it to be stripped of a claim which it does not possess, viz., untried novelty—and to place it in the light of an experiment for public adoption, that which has been long known and conducted both in the laboratory and at the lecture table.—EDITOR C. E. & A. JOURNAL.]

NEW MANUFACTURE OF LIME.

Patented by Messrs. Daniell and Hutchinson, May 4, 1843; Specification enrolled, November 4, 1843.

Lime is at present usually manufactured from limestone, or chalk, or other substances in which it exists in an indurated state, or state of solid combination with other bodies. The nature of Messrs. Daniell and Hutchinson's invention consists in their having discovered that there are large tracts of sand on the coasts of this kingdom, and particularly on the coasts of the county of Cornwall, which are at present either treated as valueless or made use of, like other sand, for purposes of mechanical intermixture merely, as in the making of mortar, breaking up of tenacious soils, &c.; but from which, nevertheless, lime of an excellent quality, applicable to building, agricultural, manufacturing, and other purposes, can be manufactured in large quantities. The patentees state that they have ascertained, "by numerous and careful analyses of the sand referred to, that it usually contains more than 70 *per cent. of carbonate of lime.*" The mode of reduction which they adopt is thus described:—"In the *first* place, in order to test whether the sand on which we propose to operate is of the proper quality, we put an ascertained quantity into a retort, and pour dilute muriatic acid upon it; if it contain carbonate of lime, a violent effervescence ensues, and carbonic acid is rapidly evolved (the presence of which may be readily detected by its reddening litmus paper.) We then neutralize the muriatic acid by the addition of liquid ammonia, and precipitate the lime by adding the carbonate of ammonia in excess. We next weigh this precipitate, which gives us a measure of the average quantity of lime which may be extracted from larger quantities of the sand of which that experimented upon was a sample. If the weight of the precipitate is from six to eight tenth parts of the original weight of sand tested, then the sand is of a proper quality for the purpose of our manufacture; but if much under that, the product will in some places not be sufficient to defray the expenses of reduction. In manufacturing the lime on a large scale, we proceed as follows:—we make use of reverberatory furnaces, varying in size according to the quantities operated upon, but the bodies of which are generally from 20 to 30 feet in length, from 6 to 10 feet in their greatest width, but gradually contracted towards the end, where they open into the chimney, and from 15 inches to 2 feet in height. The sand is laid upon the bed of the furnaces to the height of the bridges, which are made a little higher than usual, in order that they may protect the sand from being blown forward by the direct action of the current of flame upon them. The high degree of heat to which the sand is here exposed expels the carbonic acid so quickly, that in about two hours the process of conversion is generally perfected The lime is then withdrawn from the furnace through doorways made at intervals, either in the sides, end, or bottom, for that purpose. It is now in a proper state to be employed as a manure; but to fit it for the various other purposes to which it may be applied, we first pass it through fine sieves to separate any extraneous substances which it may contain."

When it is desired to convert the lime so obtained into hydrate of lime, the patentees add the necessary equivalent of water; if into sulphate of lime, or gypsum, they add the necessary equivalent of sulphuric acid; and so on through all the various combinations of which lime is susceptible.—*Mech. Mag.*

MISCELLANEA.

NORTH SHIELDS.—The Old Gas Company. The North Shields Gas works have resolved to divide their capital stock into 1300 shares of 5*l.* each, and to allot them in lots of not more than 10 shares each to gas consumers and reduce the rates of burners and of gas to 7*s.* per 1000 ft. from January 1st. 1844. The New Company "Borough of Tynemouth Gas Co." in which 1595 shares are taken by consumers, and 433 by non-consumers, offer to take the prices the old company have reduced them to in Oct. 1844. The old company was established in 1821, and the new company assert that up to 1831 they were receiving 12½ per cent. more than companies generally. Feeling runs very high, and whether the truth of the adage of "two of a trade" will be verified, time will show.

CASE OF LAW AS TO OPENING OUT NEW WINDOW LIGHTS.—At an adjourned quarter sessions held at Guildhall, Newcastle-on-Tyne, October 30th, to decide a dispute as to compensation to be paid to an individual by the corporation for setting his house back on a line with the other buildings. His house projected before the adjoining house to the extent of 5½ feet. The adjoining house was set back by the corporation thirty years ago. The counsel for the defence said:—"If Mr. —— had a right to windows in the side wall, why had he never had them there before. The fact was, that he could not put out windows overlooking another person's property, and if he had made windows in the side wall, the corporation, or the person whose property was overlooked, could screen them up and obstruct the light. The plaintiff had no right to ask compensation for a side frontage that did not belong to him, and that he would not be permitted to have." The Recorder in summing up said, "that there was only one point of law to which he would direct the attention of the jury, which was, the right to put out windows on the flank wall. He was of opinion the proprietor had not the right to do so and, therefore, whatever benefit they might think would arise to the property from having this additional light must be left out of the account in awarding damages." It was a special jury case, and the offer of the corporation was 150*l.* the sum claimed was 900*l.* and the verdict 225*l.* The setting back of the property was compulsory under the powers of a town improvement act.

NEWCASTLE-ON-TYNE.—There are now three projects for a high Level Bridge at Newcastle, at least notices of intended application to Parliament have been given, but the site as proposed by Mr. Green is that sanctioned by Mr. Hudson, and Mr. Geo. Stephenson, the other two are by Mr. Grainger and the Carlisle and Brandling Junction Railway.

CHATHAM, Nov. 10.—The Admiralty have given directions for metal mills to be erected in this dock-yard, similar to those at Portsmouth, for the purpose of supplying the eastern yards with copper bolts and sheets of copper. It is also rumoured that the Admiralty have it in contemplation to enlarge the yard, and also to make a large wet-dock for the reception of first-class ships. The Watt steam-frigate is fast progressing, owing to the number of hands on her.

FLAT ROOFS.—Mr. Loat of Clapham, builder, has lately obtained a patent for what he calls an improved mode of constructing floors and roofs, which are formed by a series of hollow vessels of earthenware, that have been in use for many years in forming arches; but instead of laying them with a curve, Mr. Loat lays them flat on boards and combines them together with cement, and when the roof or floor is completed and the cement set, the boards are removed; the upper surface is covered with flat tiles or slates bedded in cement. The under surface, he states, can be lathed with iron laths or hoops, and plastered over with lime and hair; why not dispense with the laths, would there not be sufficient key for the plastering without?

PAPER CLOTH.—Mr. Chapman of Arundel-street, Strand, lately obtained a patent for covering one or both sides of any fabric, such as canvas, muslin, calico, or linen, with paper suitable for writing, printing, or drawing; it is made by pressing the pulp on the fabric with a solution of gum, glue, or other adhesive material, and passing it between rollers, by which means the cloth and paper are firmly united.

The Iron Steamer Nimrod.—This iron steamer, built by Messrs. Thomas Vernon and Co., for the Liverpool and Cork station, took her trial trip on Thursday the 23d ult., proceeding several miles out to sea, and performing in the most admirable manner. There was none of the usual vibration perceptible from her engines, which were manufactured by Messrs. Bury, Curtis, and Kennedy, and it is remarkable that although they occupy so much less space than the ordinary side lever engines, as to leave 10,000 feet more capacity in the holds, they worked to a speed which has already stamped her as a fast-sailing vessel. It is a fact worthy of being recorded, that her keel was only laid on the 6th of May, and she is now ready for her destined voyages—a vessel of 600 tons burthen, and 300-horse power.—*Liverpool Mercury.*

Neapolitan Steamer.—On Saturday the 18th ult., the war-steamer *Roberto*, built in this country for the Neapolitan Government, made her trial trip from Blackwall to Gravesend, which she performed admirably. The revolutions were 21½ per minute, and her speed rather more than 12 miles an hour. Her tonnage is 1,056, horse power 300, length 190 feet, breadth 34, depth of hold 19. Her reported armament is two large swivel guns, to carry hollow shot, and four 32-pounders. She is the last of the four ordered, and will leave shortly for Naples. She was built by Mr. Pritchard, of Northfleet, and her engines were made by the patentees, Messrs. Maudslays and Field. They are the double cylinder engines. The *Roberto* bears a close resemblance to the five war-steamers built and fitted with engines (by the same parties) for the Russian Government some time since.

Iron Keel Plates.—Mr. Boydell, of the Oak Farm Works, Staffordshire, has obtained a patent for forming keel plates, by rolling instead of hammering, by taking two pieces of angle iron for the sides, and a flat plate for the bottom from 7 to 9 feet long, which are held together by wooden cramps, and then placed in a furnace and heated to a welding heat; by this means the cramps are consumed, and the edges of the metal are melted just sufficiently to unite the three pieces; they are then taken from the furnace and passed between rollers, of the requisite form of the keel for securely welding them together.

LIST OF NEW PATENTS.

(From Messrs. Robertson's List.)

GRANTED IN ENGLAND FROM OCTOBER 27 TO NOVEMBER 21, 1843.

Six Months allowed for Enrolment, unless otherwise expressed.

Jonathan Bell, jun., of Abbey-street, Bethnal-green-road, trimming manufacturer, for "*improvements in machinery for manufacturing elastic braid.*"—Sealed October 27.

Alonzo Grandison Hull, of Clifford-street, Bond-street, doctor of medicine, for "*improvements in manufacturing or improving fermented and distilled liquors.*"—October 27.

John Kibble, of Glasgow, gent., for "*improvements in apparatus for propelling vessels.*"—Nov. 2.

Matthew Leach, of Manchester, mechanic, for "*improvements in rotary steam engines, which improvements are applicable to pumps for lifting and forcing water.*"—Nov. 2.

Joseph Dickinson Stagg, of Middleton, in Teesdale, Durham, manager of smelting works, for "*a new and improved plan for collecting, condensing and purifying the fumes of lead, copper, and other ores and metals, also the particles of such ores and metals arising, or produced from the roasting, smelting, or manufacturing thereof, and also the noxious smoke, gases, salt and acids, soluble and absorbable in water, generated in treating and working such ores and metals.*"—Nov. 2.

David Evans, of Coleshill-street, Eaton-square, engineer, for "*improvements in sweeping and cleansing chimneys and flues, and in increasing the draft therein, and in preventing the same from smoking.*"—Nov. 2.

Joshua Proctor Westhead, of Manchester, manufacturer, for "*a new or improved fabrics, or new and improved fabrics, and also certain modifications of machinery for making the same, which modifications of machinery are applicable to the manufacture of woven fabrics.*"—Nov. 2.

Frederic Isaac Welch, of Birmingham, manufacturer, for "*an improvement or improvements in the manufacture of leather.*"—Nov. 2.

Robert Davison, of Brick-lane, Spitalfields, civil engineer, and William Symington, of East Smithfield, civil engineer, for "*a method of cleansing, purifying, and sweetening casks, vats and other vessels.*"—Nov. 2.

William Edward Newton, Chancery-lane, civil engineer, for "*improvements in furnaces or fire-places.*" (A communication.)—Nov. 4.

Robert Raynsford Jackson, of Blackburn, cotton spinner, for "*improvements in the machinery or apparatus to be used in the preparation of cotton and other fibrous substances for spinning.*"—Nov. 4.

Pierre Armand Lecomte de Fontainemoreau, of Skinners'-place, Size-lane, London, for "*an improved crane called "Dynamometric.*" (A communication.)—Nov. 4.

William Rowan, of the firm of John Rowan and Sons, of Doagh Foundry, Antrim, engineer, for "*improvements in axles.*"—Nov. 7.

Benjamin Parsons, of York-road, Lambeth, engineer, and Edward Esdaile, of the City Saw Mills, City-road, machine sawyer, for "*an improved machine for cutting leaves of wood, such as those commonly called "scale board.*"—Nov. 9.

Charles Drury Hazen, of Nottingham, merchant, for "*improvements in machinery for knitting stockings and other articles.*" (A communication.)—Nov. 9.

Arthur Dunn, of Rotherhithe, soap-boiler, for "*improvements in the manufacture of soap.*"—Nov. 9.

William Bush, of Union-street, Deptford, engineer, for "*improvements in rendering magnetic needles less prejudicially influenced by local attractions.*" Nov. 9.

Thomas Clarendon, of Great Brunswick-street, Dublin, gent., for an "*improved method of shoeing horses.*" (A communication.)—Nov. 9; two months.

Samuel Archer, of Rochdale, flannel manufacturer, for "*improvements in the manufacture of flannel.*"—Nov. 9.

Walter Hancock, of Stratford, Essex, engineer, for "*improvements in the manufacture of caoutchouc and caoutchouc in combination with other substances, and in machinery or apparatus for preparing caoutchouc and other materials.*"—Nov. 9.

George Holmes, of Stroudwater, engineer, for "*improvements in furnaces or fire-places.*"—Nov. 9.

Samuel Heseltine, jun., of Bromley, Middlesex, engineer, for "*improvements in engines to be worked by air or other gases.*"—Nov. 9.

William Edward Newton, of Chancery-lane, civil engineer, for "*improvements in machinery for preparing and combing wool, hair, and other fibrous substances.*" (A communication.)—Nov. 16.

John Withers, of Smethwich, Stafford, manufacturing manager, for "*an improvement or improvements in the manufacture of glass.*"—Nov. 16.

Luke Smith, of Manchester, mechanic, for "*improvements in, or applicable to, looms for weaving various kinds of fabrics,*"—Nov. 16.

Edward Buxton, of Basinghall-street, merchant, for "*improvements in spinning wool, cotton, and other fibrous materials.*" (A communication.)—Nov. 16.

George Scott, of New City Chambers, Bishopsgate-street, London, gentleman, for "*improvements in the manufacture, purification, and combustion of gas or gases.*"—Nov. 16.

James Smyth, of Peasenhall, Suffolk, machine maker, for "*improvements in the construction of drills for sowing grain, seeds, and manure.*"—Nov. 16.

George Gwynne, of Putney, gentleman, and George Fergusson Wilson, of Belmont, Vauxhall, gentleman, for "*improvements in the manufacture of candles, and in apparatus for, and processes of treating fatty and other substances for the making of candles, and other uses.*"—Nov. 16.

Ramsay Richard Reinagle, of Howland-street, civil engineer, for "*improvements in applying atmospheric air as a motive power.*"—Nov. 16.

Arthur Wall, of Bisterne-place, Poplar, surgeon, for "*improvements in the manufacture of iron.*"—Nov. 18.

James Roose, of Birmingham, gentleman, for "*an improvement or improvements in the mode or method of manufacturing gun barrels and ordnance.*"—Nov. 18.

William Shepherd, of Kingston-upon-Hull, joiner and builder, for "*an improved four port slide-valve, and an improved controller for reversing steam-engines, and for working the steam expansively in the cylinder.*"—Nov. 18.

Edward Elliott, of the Tower Royal, engineer, for "*a means of adding power to the steam engine, and other machinery.*"—Nov. 18.

Moses Poole, of Serle-street, gentleman, for "*improvements in the manufacture of parts of knives ond other cutting instruments.*" (A communication.)—Nov. 18.

Edmund Snell, of Bridge-road, Lambeth, Surrey, medical student, for "*improvements in the manufacture of soap.*"—Nov. 21.

Thomas Hancock, of Goswell-mews, Goswell-road, waterproof cloth manufacturer, for "*an improvement or improvements in the preparation or manufacture of caoutchouc, in combination with other substances, which preparation or manufacture is suitable for rendering leather, cloth, and other fabrics waterproof, and to various other purposes for which caoutchouc is employed.*" Nov. 21.

John Coope Haddan, of Liverpool-street, King's-cross, engineer, for "*improvements in the mode of manufacturing papier mâché, and other articles made of vegetable pulp.*"—Nov. 21.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for "*improvements in the manufacture of pills.*"—Nov. 21.

Octavius Dillingham Mordaunt, of Clifford-street, Bond-street, gentleman, for "*improvements in apparatus for obtaining the profile of various forms or figures.*" (A communication.)—Nov. 21.

Moses Poole, of Lincoln's-inn, gentleman, for "*an improved machine for towing or propelling vessels, which can also be used as a boat.*" (A communication.)—Nov. 21.

Antonio Francis Jean Claudet, of High Holborn, glass merchant, for "*improvements in the process and means of obtaining the representation of objects of nature and art.*" (A communication.)—Nov. 21.

Francis Higginson, of the town of Rochester, Lieutenant in the Royal Navy, for "*improvements in fastenings for part of ships and other vessels which improvements are also applicable to other building purposes.*"—Nov. 21.